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ABSTRACT

The State Council of Higher Education for Virginia (SCHEV) is required by statute to prepare plans under which the state-supported institutions of higher education shall constitute a coordinating system. To do so, SCHEV must first assess the current state of the system and make predictions about its future. This needs assessment evaluates, for the period from 2001-2010, the demand for, and supply of, higher education services in the Commonwealth and potential gaps between the two. The report documents four major findings from a variety of sources: (1) Virginia will experience a significant increase in higher education enrollment demand between 2001 and 2010; (2) the state's inventory of current and authorized higher education facilities is inadequate to absorb the anticipated increase in enrollment demand between 2001 and 2010; (3) attendance rates at four-year colleges and universities tend to be lower in Southwest Virginia and the Southern Piedmont than they are in the rest of the Commonwealth; and (4) there may be significant gaps between the number of college graduates Virginia produces each year and the number it requires in two key areas: information technology and teaching. The Council will use this information as the basis for the development of a statewide strategic plan for higher education. (SLD)

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A SCHEV REPORT

Systemwide Needs Assessment for Virginia Higher Education: 2001

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STATE COUNCIL OF HIGHER EDUCATION FOR VIRGINIA

ADVANCING VIRGINA THROUGH HIGHER EDUCATION

March 28, 2002

HE035381

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Executive Summary

The State Council of Higher Education for Virginia (SCHEV) is required by statute to "prepare plans under which the state-supported institutions of higher education shall constitute a coordinating system." Before the Council can move forward with a strategic plan for the system, however, it first must assess the current state of the system and make predictions about its future. Pursuant to its statutory requirement for planning, and to answer questions that have recently been raised regarding the need for new campuses within the state, in 2000 SCHEV initiated the development of a System-Wide Needs Assessment for Virginia Higher Education. The primary purpose of the System-Wide Needs Assessment is to assess, for the ten-year period from 2001 through 2010, the demand for, and supply of, higher education services in the Commonwealth and identify potential gaps between the two. This report presents the results of that assessment. The report documents four major findings:

1. Virginia will experience a significant increase in higher education enrollment demand between 2001 and 2010.

System-wide, Virginia's public and private institutions of higher education can anticipate approximately 38,296 additional undergraduate and graduate students between now and fall 2010. This projected increase in enrollment is being driven by the "echo-boom" – the children of the "baby-boom" generation who are now entering their peak college attendance years. This means that much of the increased enrollment will be comprised of "traditional-aged" students – those between the ages of 18 and 24. In addition, we know from available projections of high school seniors that almost all of this growth will originate in a handful of localities located in the I-95/I-64 crescent in the eastern portion of the Commonwealth. These two factors strongly imply that colleges and universities whose institutional missions are geared toward serving "traditional-aged" students, and who draw a large proportion of their students from the I-95/I-64 crescent, are likely to experience the greatest increase in enrollment demand. The one category of institutions that meets both of these criteria is Virginia's public four-year institutions.

2. Virginia's inventory of current and authorized higher education facilities is inadequate to absorb the anticipated increase in enrollment demand between 2001 and 2010.

Assuming no additional construction beyond that already financed, by the end of the decade (FY 2011) enrollment in Virginia's public four-year colleges and universities will likely outstrip the capacity of these institutions' instructional

and academic support space by somewhere between 9,172 and 14,466 students. Enrollment in the Virginia Community College System will likely outstrip the instructional and academic support space capacity by somewhere between 7,827 and 13,189 students. In contrast to the public colleges and universities, Virginia's private non-profit institutions indicate that they have sufficient instructional and academic support space to absorb an additional 6,400 students currently, and an additional 17,200 students by 2010. Beyond shortages of instructional and academic support space, some public and private institutions indicated in survey responses that their ability to absorb additional enrollment is also compromised by needed renovations, insufficient dormitory and dining facility space, insufficient telecommunications and facilities infrastructure, inadequate base funding (including number of faculty, appropriate mix of part-time and full-time faculty, and student services), and inadequate support for the operation and maintenance of physical plant.

3. **Attendance rates at four-year colleges and universities tend to be lower in Southwest Virginia and the Southern Piedmont than they are in the rest of the Commonwealth.**

SCHEV's analysis indicates that college attendance rates at four-year colleges and universities (public and private combined) tend to be lowest in Southwest Virginia and the Southern Piedmont. In contrast, attendance at community colleges tends to be highest in those regions. For "non-traditional" students (25 years of age and older), geographic access may explain at least a portion of these differences. When SCHEV used Geographic Information System (GIS) analysis to assess enrollment rates in four-year institutions by locality, we find that enrollment rates for "non-traditional" students tend to be highest in localities that are within a 30-minute drive of a public or private four-year institution. In addition to geographic access, SCHEV's analysis also shows that the nature of the job market and other economic factors characteristic of Southwest Virginia and the Southern Piedmont may also play a role in driving down four-year college attendance rates in those regions.

4. **There may be significant gaps between the number of college graduates Virginia produces each year and the number it requires in two key areas – information technology (systems analysts, computer engineers, and computer support specialists) and teaching (preschool, elementary, and secondary).**

Higher education serves as an engine of economic development in at least three ways – research, the commercialization of intellectual capital, and by providing a well-educated and well-trained workforce. Focusing on the latter of these, we compared the number of college graduates Virginia produces in specific

instructional programs to the number of average annual openings in associated occupations. This analysis identified 25 occupations where a potential shortage of graduates exists. The most significant gaps appear to be in information technology (systems analysts, computer engineers, and computer support specialists) and teaching (preschool, elementary, and secondary).

The Council, over the next year, will take the results of this System-Wide Needs Assessment, and use it as a basis for development of a statewide strategic plan, which, among other things, will identify strategies to meet the increasing demands on higher education services of the next decade. Development and implementation of a statewide strategic plan will better position the Commonwealth to respond to the challenges that its system of higher education is likely to face over this decade. The solutions will be many, and the leadership and commitment necessary to meeting these challenges cannot be underestimated.

Acknowledgements

As with most SCHEV initiatives, the production of this report involved a team effort. The project team was led by Dr. Fletcher Mangum, SCHEV's Chief Economist, and also included Mr. Wendell Pai from SCHEV's Research Section, and Dr. Yan Zheng from SCHEV's Finance Section. Ms. Phyllis Palmiero, Executive Director, Dr. Nancy Cooley, Academic Affairs Director, Mr. Tod Massa, Research Director, Mr. G. Paul Nardo, Communications Director, and Ms. Amy Sebring, Finance Director, also contributed to the final report.

The project team is greatly indebted for early direction and feedback to an advisory committee established to assist in this initiative. That advisory committee included: Mr. Hugh Keogh, Virginia Chamber of Commerce, Dr. John Knapp, University of Virginia; Mr. Robert Lambeth, Council of Independent Colleges in Virginia; Dr. Julia Martin, University of Virginia; Ms. Susan McIver, Virginia Employment Commission; Dr. John Milam University of Virginia; Mr. Bill Shinar, Virginia Geographic Information Network; Dr.Roger Stough, George Mason University; Dr. John Sygielski, Virginia Community College System; Mr. Paul Timmreck, Virginia Commonwealth University; and Ms. Jean Tingler, Virginia Economic Development Partnership.

Finally, the project team would like to express its profound appreciation to the many individuals within Virginia's public and private institutions of higher education who graciously provided data, advise, and constructive criticism, and without whom this report would not have been possible.

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Chapter 1 – Introduction

The State Council of Higher Education for Virginia (SCHEV) is required by statute to

> *... prepare plans under which the state-supported institutions of higher education of Virginia shall constitute a coordinating system. In developing such plans, the Council shall consider the future needs for higher education in Virginia at both the undergraduate and graduate levels, as well as the mission, programs, facilities and location of each of the existing institutions of higher education.*

Before the Council can move forward with a strategic plan for the system, however, it first must assess the current state of the system and make predictions about its future. Pursuant to its statutory requirement for planning, and to answer questions that have recently been raised regarding the need for new campuses within the state, in 2000 SCHEV initiated the development of a System-Wide Needs Assessment for Virginia Higher Education. The primary purpose of the System-Wide Needs Assessment is to assess, for the ten-year period from 2001 through 2010, the demand for, and supply of, higher education services in the Commonwealth and identify potential gaps between the two. This document reports on the findings from that initiative.

As with all good strategic planning efforts, the Council's Strategic Plan is intended to reflect an organic and continuous process. The findings from the System-Wide Needs Assessment will set the stage for development of the 2003 System-Wide Strategic Plan for Virginia Higher Education. In developing the system-wide strategic plan, the Council, in partnership with Virginia's colleges and universities, state policy makers, and other interested parties, will propose strategic planning initiatives that identify the types of resources that will be necessary to meet Virginia's current and projected higher education needs, and where they will be needed, both from a programmatic and a geographic perspective.

The System-Wide Needs Assessment focuses on five major areas of analysis:

Enrollment Demand

Pursuant to statutory mandate, each biennium SCHEV produces six-year student enrollment projections for Virginia's public colleges and universities. These projections are generated through a consensus process that involves staff from SCHEV, the institutions, the Governor's Department of Planning and Budget, and the General Assembly. One of the methods that SCHEV uses to assess likely future enrollments is a demographic model that employs student-level enrollment data to map projected county-level changes in population into future enrollments. In this portion of the System-Wide Needs Assessment, a substantially modified and expanded version of that existing demographic model is used to identify enrollment demand, or the number of individuals who, all else equal, are likely to attend public and private Virginia institutions of higher education during the period from 2001 to 2019. This analysis is presented in Chapter 2 of this report.

Enrollment Capacity

As part of its annual system-wide review and prioritization of higher education capital outlay projects, SCHEV uses guidelines that measure the adequacy of each public college and university's current inventory of building space relative to its enrollment. In this portion of the System-Wide Needs Assessment, we use modified versions of those guidelines, in combination with SCHEV's building-by-building facility, room-by-room utilization databases, and survey data, to develop estimates of current and future system-wide (public and private) enrollment capacity. This analysis is provided in Chapter 3 of this report.

Access

Recent proposals for new campuses in south-central Virginia and Virginia Beach have been motivated in part by the belief that there are populations within those areas that are inadequately served by existing public colleges and universities. In an attempt to provide information that may shed light on these issues, SCHEV has used Geographic Information System (GIS) technology to identify categories of individuals who may currently have inadequate access to higher education services. That analysis is presented in Chapter 4 of this report.

Economic Development

Higher education serves as an engine for economic development in the Commonwealth in at least three ways: research, commercialization of intellectual property, and by providing a well-educated and well-trained workforce. In this component of the System-Wide Needs Assessment, SCHEV focuses on the last of these by using occupational employment projections and Virginia college graduate data to identify occupations where Virginia may face shortages of skilled labor in the future. The primary purpose of this analysis is to provide information to policy makers on potential labor market "bottlenecks" that could affect Virginia's continued economic prosperity. This analysis is presented in Chapter 5 of this report.

Technology

It is widely recognized that distance learning and other "e-learning" technologies have had, and will continue to have, a significant impact on traditional definitions of enrollment capacity. For example, a 1999 report for the Washington State Higher Education Coordinating Board found that "recent developments in higher education have raised significant questions as to the advisability and necessity of continuing to increase total campus space in approximate direct proportion to enrollment growth." In order to shed light on where, and to what extent, "e-learning" can be used to compliment and extend existing access to Virginia higher education, SCHEV has also evaluated Virginia's current inventory of "e-learning" programs and identified issues likely to impact this area in the near future. That analysis is presented in Chapter 6 of this report.

In Chapter 7 of this report, the final chapter, the findings from these five core areas of analysis are summarized and a non-exhaustive list of potential solutions to the issues raised is provided for consideration in development of the 2003 System-Wide Strategic Plan for Virginia Higher Education.

Chapter 2 – Enrollment Demand Projection for 2001-2010

Introduction

Pursuant to statutory mandate,[1] each biennium SCHEV works with Virginia's public colleges and universities, and the Governor's Department of Planning and Budget to develop student enrollment projections for each institution of higher education.[2] These projections detail the number of students each institution expects to enroll over a six-year planning horizon based on current admissions trends, capacity, and institution policies regarding enrollment growth. Because they are constrained by capacity and institutional policy considerations, however, these student enrollment projections do not actually address the issue of future *enrollment demand* – the number of qualified students who would otherwise be expected to seek admission to Virginia's colleges and universities if space were available. To more adequately address this issue, provide information on system-wide (public and private) enrollment, and obtain more information on the likely characteristics and needs of future students, SCHEV has augmented its current enrollment projection process by creating an *enrollment demand* projection model. In this chapter a description of that model and the results obtained from it are provided. This information follows in the section entitled *Where We Are Going*. To better understand where we are going, however, perhaps we should first take a look at *Where We Are*.

Where We Are

Virginia's system of higher education is comprised of eighty-eight colleges and universities in four sectors (public four-year, public two-year, private non-profit, and private for-profit).[3] In fall 2000 these institutions of higher education had combined enrollments of 372,307 students.[4] This represents a 19,977 student,

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[1] Section 23-9.6:1.4 of the *Code of Virginia* tasks the State Council to, "...review and approve or disapprove all enrollment projections proposed by each public institution of higher education."

[2] SCHEV, in collaboration with staff from the institutions, the House Appropriations and Senate Finance Committees, and the Department of Planning and Budget, develops six-year projections, corresponding to the Commonwealth's six-year capital planning process, for each public four-year institution and Richard Bland College. Currently, projections are not made for the Virginia Community College System or Virginia's private institutions of higher education.

[3] For a listing of these institutions *see* Appendix 2-A.

[4] Data source: SCHEV student enrollment database. SCHEV's student enrollment database contains comprehensive data on current and prior enrollments in Virginia's public and private institutions of higher education.

or six percent, increase over 1990, with almost all of the increase occurring since 1997 (*see* Figure 2-1).

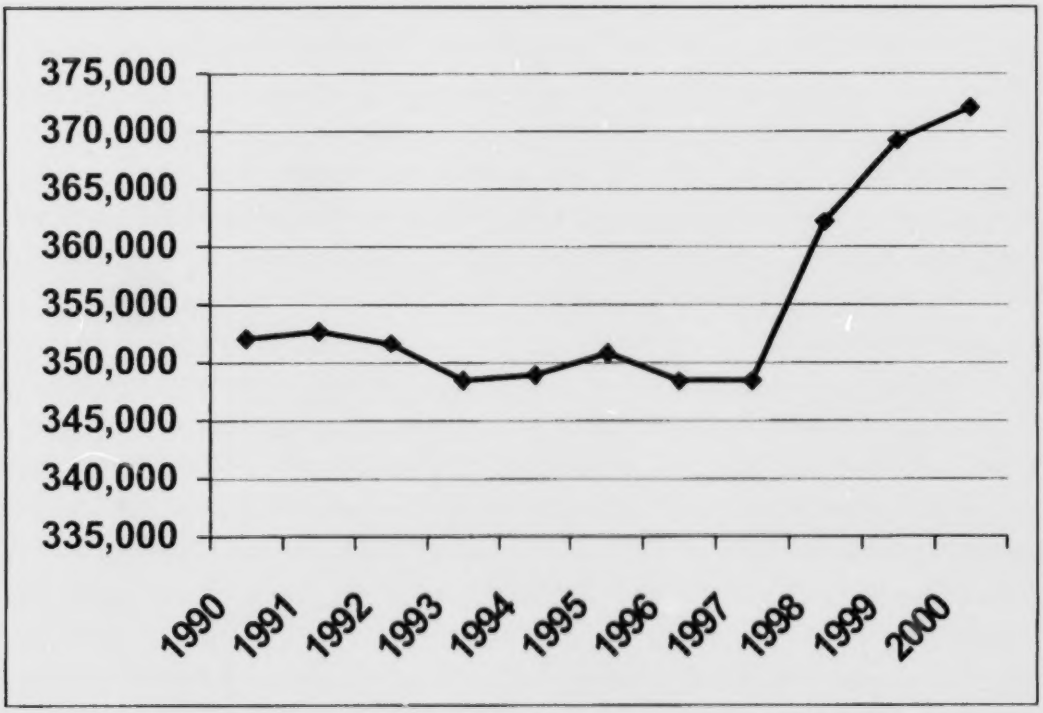

Figure 2-1: System-wide Headcount Enrollment, 1990-2000

A graphical depiction of fall 2000 enrollments showing the proportion of students in public four-year, public two-year, private non-profit, and private for-profit institutions is provided in Figure 2-2.[5]

[5] *ibid.*

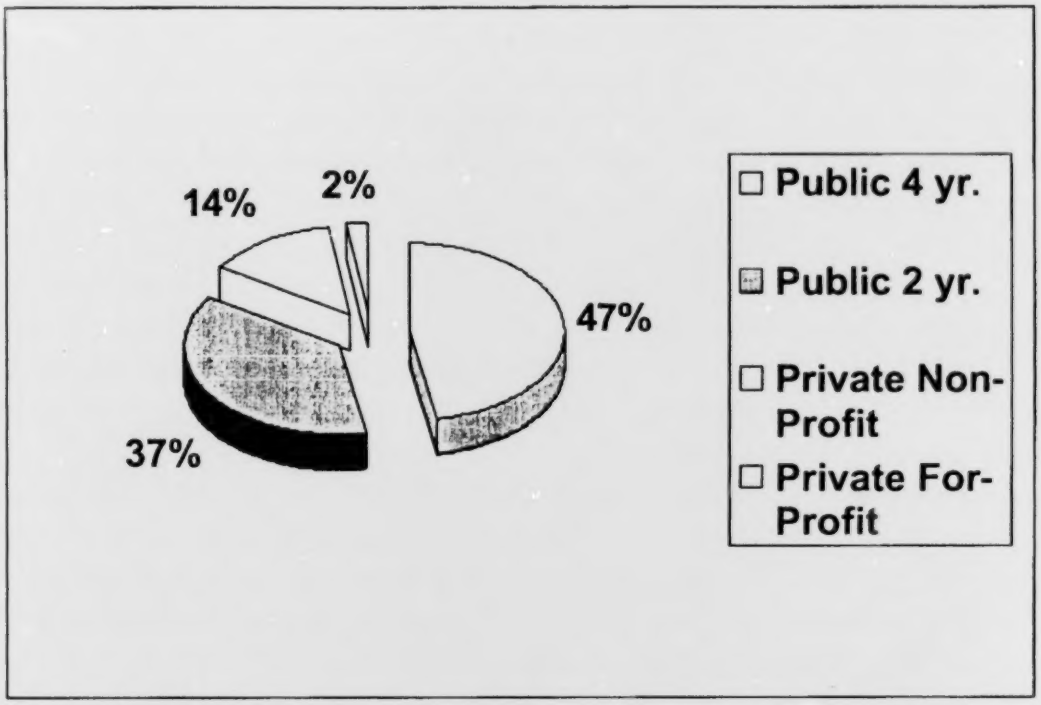

Figure 2-2: Enrollment Distribution by Institution Type, Fall 2000 Headcount

Public Four-Year Institutions

Virginia has fifteen public four-year institutions of higher education. Six of these are doctoral degree granting institutions and nine are comprehensive institutions. In fall 2000 these institutions enrolled 175,742 students, a nearly ten percent, or 15,542 student, increase over 1990 enrollment. Looking more closely at fall 2000 enrollments in Virginia's public four-year institutions, we find that they were largely made up of Virginia residents (78 percent), full-time students[6] (74 percent), and undergraduates (75 percent).[7]

As shown in Figure 2-3, another characteristic of fall 2000 enrollments in Virginia's public four-year institutions is that they were predominantly composed

[6] A full-time student is an undergraduate student who takes 15 or more credit hours each semester, or a graduate student who takes 12 or more credit hours each semester.
[7] *supra*, note 4.

of "traditional" students, students who are 24 years of age or younger.[8] As will be discussed more fully later, this is an important characteristic because traditional students enrolled at a four-year institution are more likely to live on campus and more likely to be enrolled as full-time, degree-seeking students. As a result, they are more likely to place significant demands on an institution's capital resources (*e.g.*, residence halls, classrooms, and laboratories).

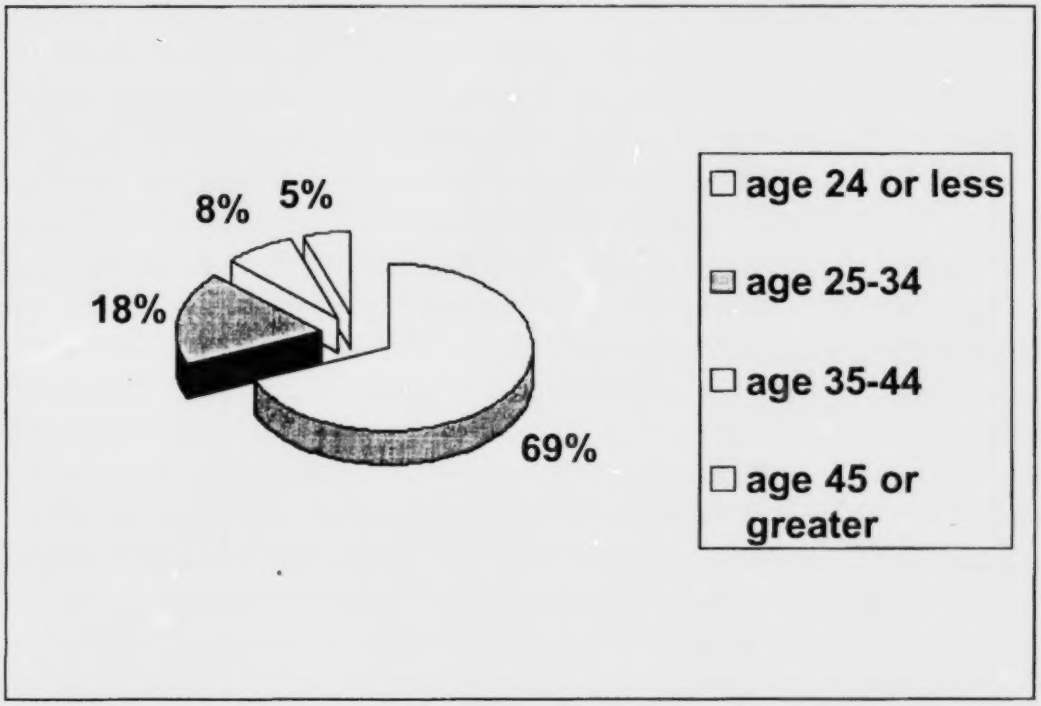

Figure 2-3: 4 yr. Publics, Age Distribution, Fall 2000 Headcount

Table 2-1 takes the data displayed in Figure 2-3 and breaks them down according to student level (*e.g.*, freshmen, sophomores, first-year graduate, etc.). As shown in this table, freshmen and sophomores were almost exclusively comprised of traditional students (97 and 93 percent respectively) in fall 2000. However, as one might expect, the modal age for graduate students tended to be older, typically in the 25 to 34 age category.

[8] *ibid.*

Table 2-1: 4 yr. Publics – Fall 2000 Headcount Enrollment by Student Level and Age

	24 or less	25 to 34	35 to 44	45 or greater
Freshman	97.3%	1.8%	0.6%	0.3%
Sophomore	93.4%	4.5%	1.5%	0.6%
Junior	84.5%	10.1%	3.8%	1.6%
Senior/Fifth	73.1%	17.6%	6.4%	2.9%
Unclassified Undergraduate	31.0%	28.9%	22.8%	17.3%
Unclassified Graduate/First Professional	8.3%	35.6%	26.0%	30.1%
First Professional	43.5%	51.0%	4.7%	0.9%
Graduate - First Year	25.0%	46.5%	17.6%	10.9%
Graduate - Advanced	5.7%	53.8%	22.5%	18.0%

Figure 2-4 depicts the distribution of enrollments in public four-year institutions across various race/ethnicity categories.[9] Here we see that in fall 2000, 74 percent of enrolled students were White, 16 percent Black, 7 percent Asian or Pacific Islander, 3 percent Hispanic, and less than 1 percent Native American.

[9] *ibid.*

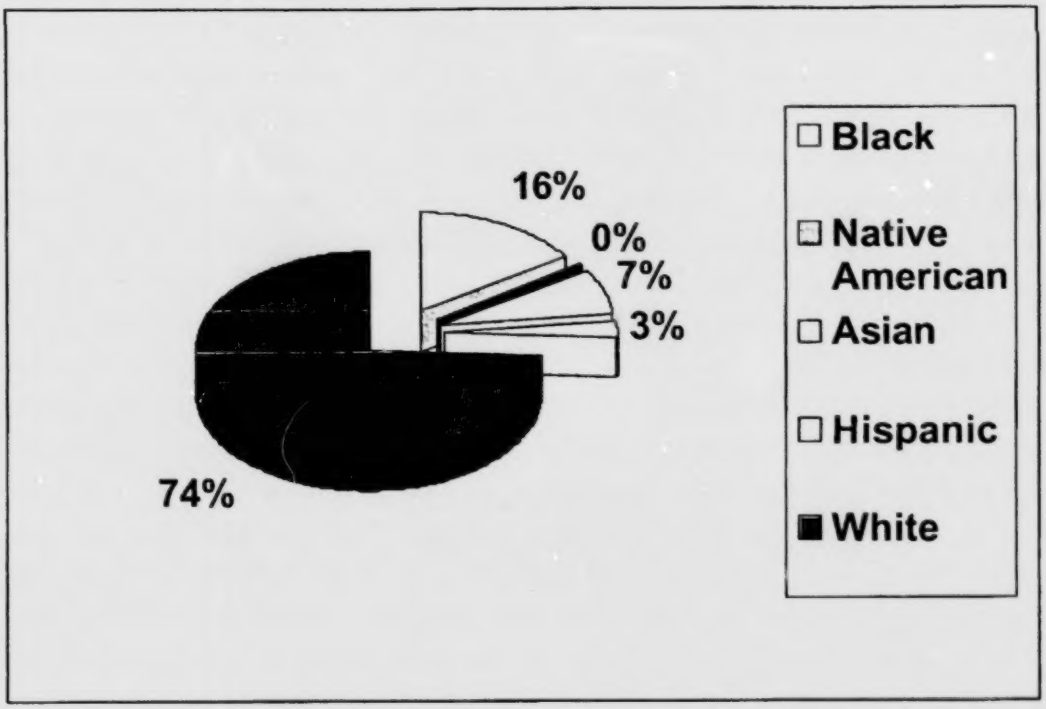

Figure 2-4: 4 yr. Publics, Race/Ethnicity Distribution, Fall 2000 Headcount

Figure 2-5 provides information on the service area of Virginia's public four-year institutions.[10] This Figure depicts a map of Virginia divided into seven regions: Central Virginia, Eastern Shore, Hampton Roads, Northern Virginia, Southern Piedmont, Southwest Virginia, and the Valley.

[10] *ibid.*

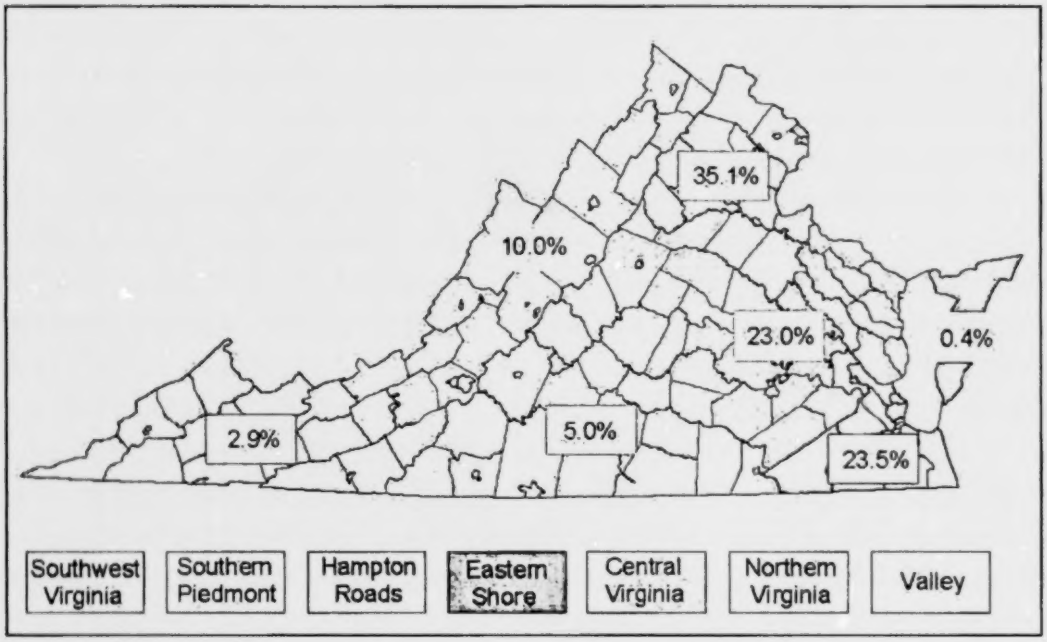

Figure 2-5: 4 yr. Publics, Service Area

As can be seen from this map, nearly 82 percent of the in-state students enrolled in Virginia public four-year institutions in fall 2000 were drawn from the I-95/I-64 crescent comprised of Northern Virginia, Central Virginia, and Hampton Roads. The importance of this characteristic will become apparent later when we discuss those portions of the Commonwealth that are most likely to see significant population growth between 2000 and 2010. The remaining 18 percent of fall 2000 in-state enrollments were drawn from the Valley (10 percent), Southern Piedmont (5 percent), Southwest Virginia (3 percent), and Eastern Shore (less than 1 percent).

Table 2-2 takes the data depicted in Figure 2-5 and disaggregates them into institution-specific service areas. As this table demonstrates, whereas some institutions tend to draw their students primarily from specific regions of the state (*i.e.*, Christopher Newport, Norfolk State, and Old Dominion Universities from Hampton Roads; George Mason and Mary Washington Universities from Northern Virginia; and the University of Virginia at Wise from Southwest Virginia), others tend to have more broadly dispersed service areas (*i.e.*, the College of William and Mary, Longwood College, Radford University, Virginia Military Institute, and Virginia Tech).

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Table 2-2: 4 yr. Publics – Service Areas

	CNU	CWM	GMU	JMU	LC
Central Virginia	15.6%	19.0%	2.7%	17.7%	28.8%
Eastern Shore	0.8%	0.5%	0.1%	0.2%	0.7%
Hampton Roads	73.3%	36.5%	2.4%	14.4%	15.6%
Northern Virginia	7.9%	34.0%	92.4%	42.5%	23.0%
Southern Piedmont	0.9%	3.7%	0.5%	4.9%	26.1%
Southwest Virginia	0.2%	1.0%	0.1%	0.6%	0.3%
Valley	1.3%	5.3%	2.0%	19.8%	5.4%

	MWC	NSU	ODU	RU	UVA
Central Virginia	13.8%	7.8%	7.4%	11.4%	26.7%
Eastern Shore	0.2%	0.9%	1.2%	0.4%	0.3%
Hampton Roads	7.9%	83.8%	73.8%	10.7%	12.7%
Northern Virginia	70.1%	3.5%	7.4%	19.2%	42.5%
Southern Piedmont	2.6%	3.3%	4.2%	10.0%	6.7%
Southwest Virginia	0.3%	0.1%	2.5%	11.0%	2.2%
Valley	5.2%	0.6%	3.5%	37.3%	8.9%

	UVA-W	VCU	VMI	VPISU	VSU
Central Virginia	4.7%	74.4%	27.5%	14.3%	43.1%
Eastern Shore	0.0%	0.1%	0.5%	0.3%	0.4%
Hampton Roads	3.4%	9.0%	18.3%	12.9%	11.4%
Northern Virginia	5.0%	11.4%	27.1%	35.7%	6.0%
Southern Piedmont	2.5%	2.8%	8.0%	6.9%	5.7%
Southwest Virginia	81.6%	0.4%	3.7%	5.0%	0.1%
Valley	2.8%	1.8%	15.0%	24.8%	1.3%

Public Two-Year Institutions

Virginia has twenty-four public two-year institutions of higher education. Twenty-three of these are community colleges and one, Richard Bland College, is a two-year junior college. In fall 2000, these institutions enrolled 138,039 students, a more than five percent, or 6,953 student, increase over 1990 enrollment. Largely reflecting the mission of the community colleges – to provide community-based higher education and workforce development programs – fall 2000 enrollment in public two-year institutions tended to be much more heavily weighted toward in-state students (94 percent), part-time students (71 percent), and undergraduates (100 percent).[11]

[11] *ibid.*

Also, in contrast to the public four-year institutions, enrollment in public two-year institutions tended to be more evenly distributed across a broad range of age categories. As shown in Figure 2-6, enrollment in fall 2000 was evenly split between traditional students (24 years of age or less) and non-traditional students (25 years of age or more).[12]

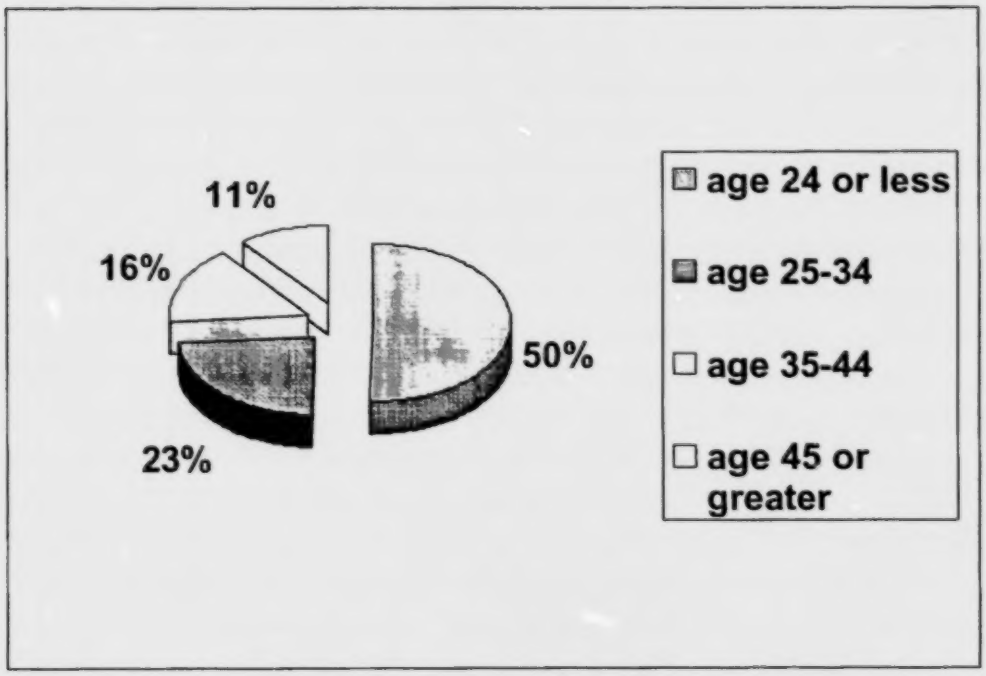

Figure 2-6: 2 yr. Publics, Age Distribution, Fall 2000 Headcount

Breaking these data down according to student level, as show in Table 2-3, further confirms the more even distribution of enrollment across various age categories. As opposed to the public four-year institutions where almost all freshmen and sophomores fell into the traditional category, in the public two-year institutions more than two-fifths of freshmen and three-fifths of sophomores fell into the non-traditional category.

[12] *ibid.*

Table 2-3: 2 yr. Publics – Fall 2000 Headcount Enrollment by Student Level and Age

	24 or less	25 to 34	35 to 44	45 or greater
Freshman	58.2%	23.4%	12.6%	5.8%
Sophomore	37.9%	30.6%	20.2%	11.3%
Unclassified Undergraduate	50.5%	18.9%	15.9%	14.7%

Figure 2-7 shows the distribution of enrollments in public two-year institutions in fall 2000 across various race/ethnicity categories.[13] In this case, the data indicate that 70 percent of enrolled students were White, 19 percent Black, 6 percent Asian or Pacific Islander, 4 percent Hispanic, and 1 percent Native American.

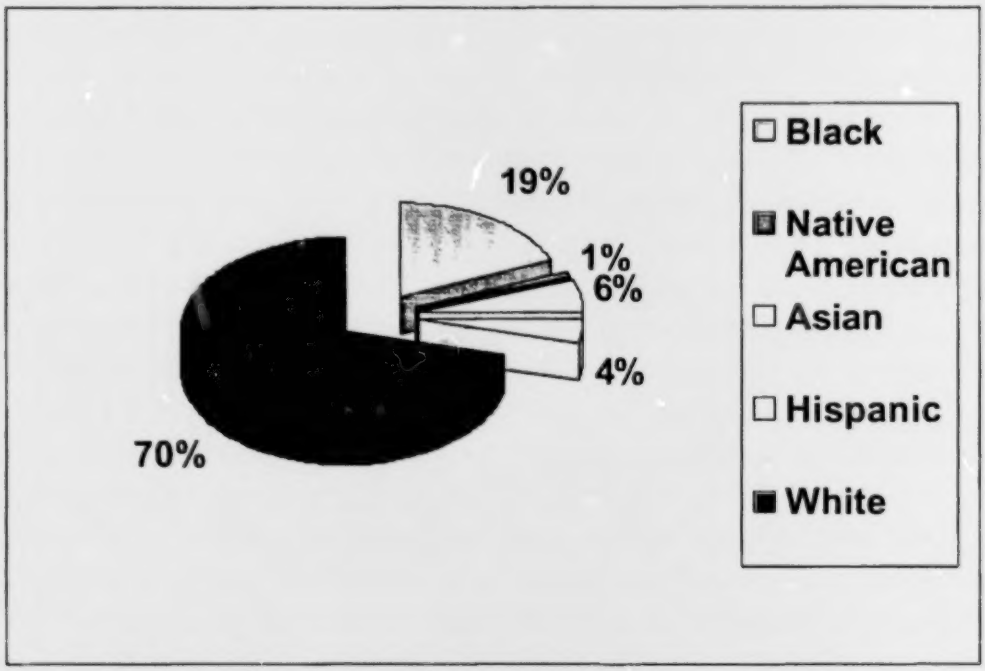

Figure 2-7: 2 yr. Publics, Race/Ethnicity Distribution, Fall 2000 Headcount

[13] *ibid.*

Figure 2-8 graphically depicts the service area for Virginia's public two-year institutions.[14] Consistent with the Community Colleges' mission of providing local access to higher education services, the service area for the public two-year institutions tends to be more broadly dispersed across the Commonwealth than that of the public four-year institutions. For instance, whereas 82 percent of the in-state students enrolled in public four-year institutions in fall 2000 were from the I-95/I-64 crescent, only 67 percent of the in-state enrollments in the public two-year institutions were. The remaining 33 percent of fall 2000 in-state enrollments came from the Valley (13 percent), Southern Piedmont (11 percent), Southwest Virginia (9 percent), and the Eastern Shore (less than 1 percent).

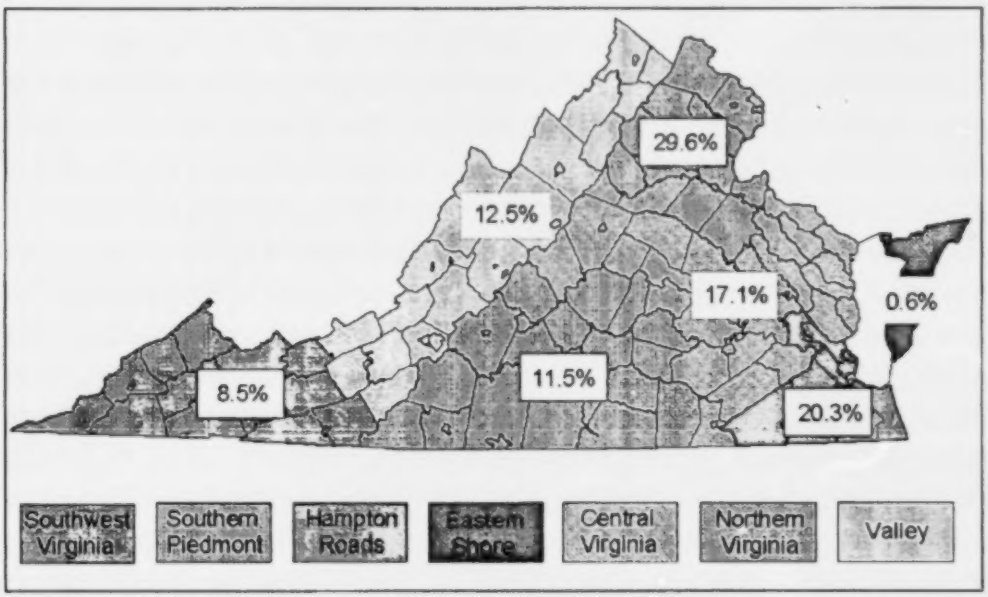

Figure 2-8: 2 yr. Publics, Fall 2000 Service Area

Table 2-4 further disaggregates these data, detailing the specific service areas for the Virginia Community College System and Richard Bland College.

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[14] *ibid.*

Table 2-4: 2 yr. Publics – Service Areas

	VCCS	RBC
Central Virginia	16.3%	98.1%
Eastern Shore	0.6%	0.0%
Hampton Roads	20.5%	0.6%
Northern Virginia	29.9%	0.3%
Southern Piedmont	11.6%	1.0%
Southwest Virginia	8.5%	0.0%
Valley	12.6%	0.0%

Private Non-Profit Institutions

Virginia has thirty-five private non-profit institutions of higher education. In combination, these institutions enrolled 50,635 students in fall 2000. This level of enrollment represents a 12 percent, or 6,833 student, decline from 1990. However, it is important to note that this decline is largely attributable to a single institution. Exclusive of that single institution, the private non-profit institutions grew by 14 percent, or 5,508 students, between 1990 and 2000.

Except for the fact that private non-profit institutions enrolled a smaller proportion of in-state students in fall 2000 (53 percent as opposed to 79 percent in the public four-year institutions), their enrollment characteristics were very similar to the public four-year institutions.[15] Like the public four-year institutions, fall 2000 enrollments at private non-profit institutions were largely full-time (80 percent), with a balance between undergraduate and graduate students (79 undergraduate percent compared to 21 percent graduate students). Also like the public four-year institutions, fall 2000 enrollments at Virginia's private non-profit institutions were heavily weighted toward traditional students (*see* Figure 2-9).

[15] *ibid.*

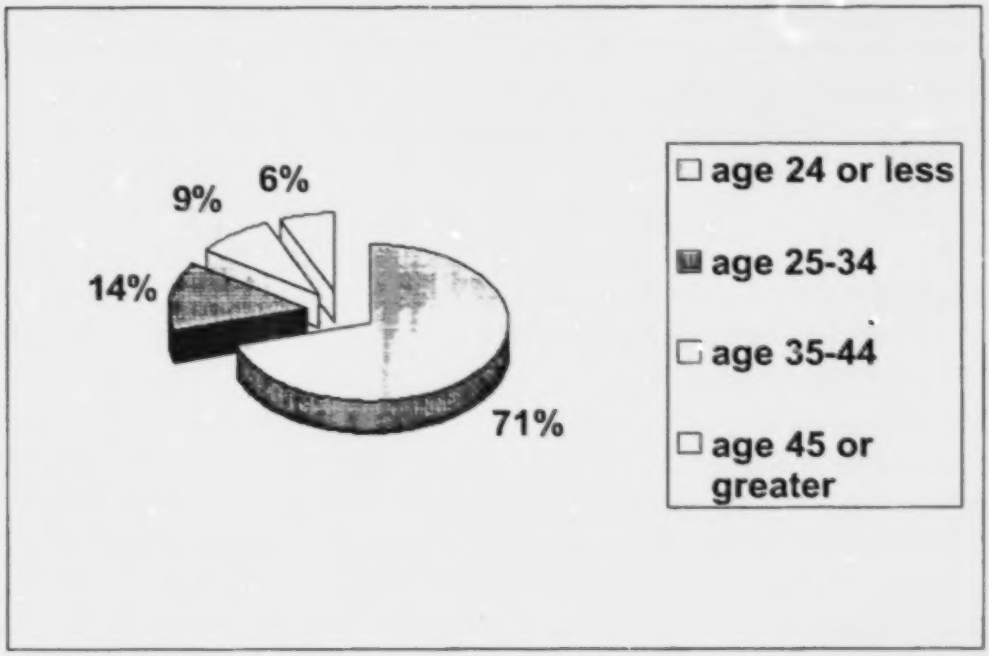

Figure 2-9: Private Non-Profits, Age Distribution, Fall 2000 Headcount

As shown in Table 2-5, this was again particularly true with respect to freshman and sophomore enrollments, those students most likely to reside on campus.[16]

[16] *ibid.*

Table 2-5: Private Non-Profits – Fall 2000 Headcount Enrollment by Student Level and Age

	24 or less	25 to 34	35 to 44	45 or greater
Freshman	90.9%	4.4%	3.1%	1.6%
Sophomore	89.4%	4.8%	3.5%	2.3%
Junior	83.6%	8.1%	5.5%	2.9%
Senior/Fifth	74.7%	12.0%	8.5%	4.8%
Unclassified Undergraduate	53.1%	20.8%	14.1%	12.0%
Unclassified Graduate/First Professional	6.9%	32.9%	25.9%	34.3%
First Professional	33.7%	43.8%	12.7%	9.8%
Graduate - First Year	15.9%	41.7%	25.1%	17.3%
Graduate - Advanced	4.4%	34.5%	35.3%	25.8%

Figure 2-10 graphically depicts the distribution of fall 2000 enrollments in the private non-profit institutions across various race/ethnicity categories. In this case, enrollments were comprised of 72 percent White, 23 percent Black, 3 percent Asian or Pacific Islander, 2 percent Hispanic, and less than 1 percent Native American.[17]

[17] *ibid.*

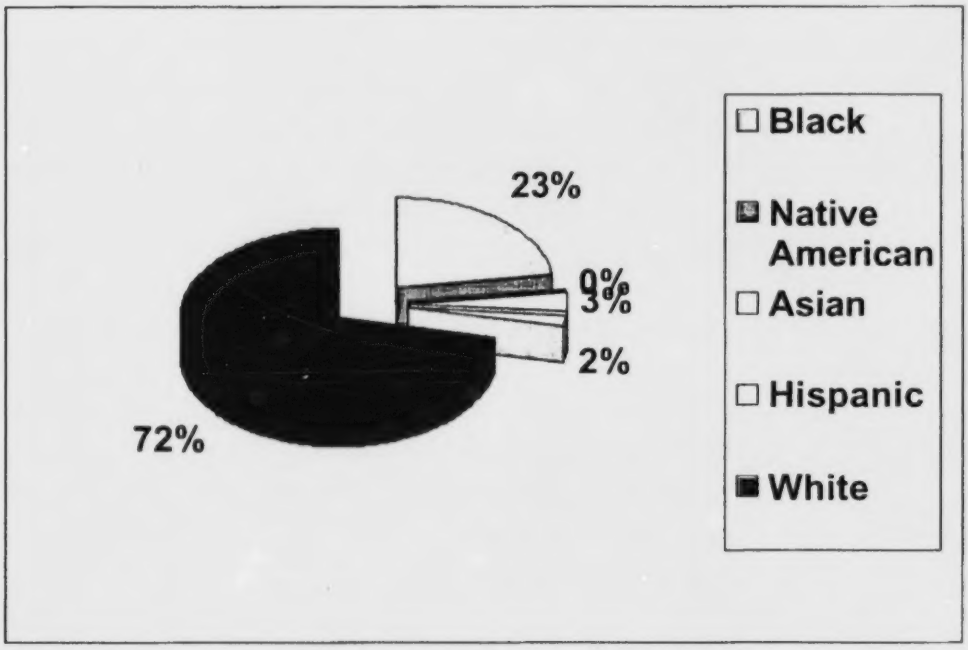

Figure 2-10: Private Non-Profits, Race/Ethnicity Distribution, Fall 2000 Headcount

Figure 2-11 shows the service area for Virginia's private non-profit institutions.[18] As can be seen from this map, these institutions drew a much more significant portion of their in-state fall 2000 enrollments from the Valley and the Southern Piedmont, with only 60 percent of their in-state enrollment coming from the I-95/I-64 crescent. The remaining 40 percent of fall 2000 in-state enrollments came from the Valley (19 percent), Southern Piedmont (16 percent), Southwest Virginia (4 percent), and the Eastern Shore (less than 1 percent).

[18] *ibid.*

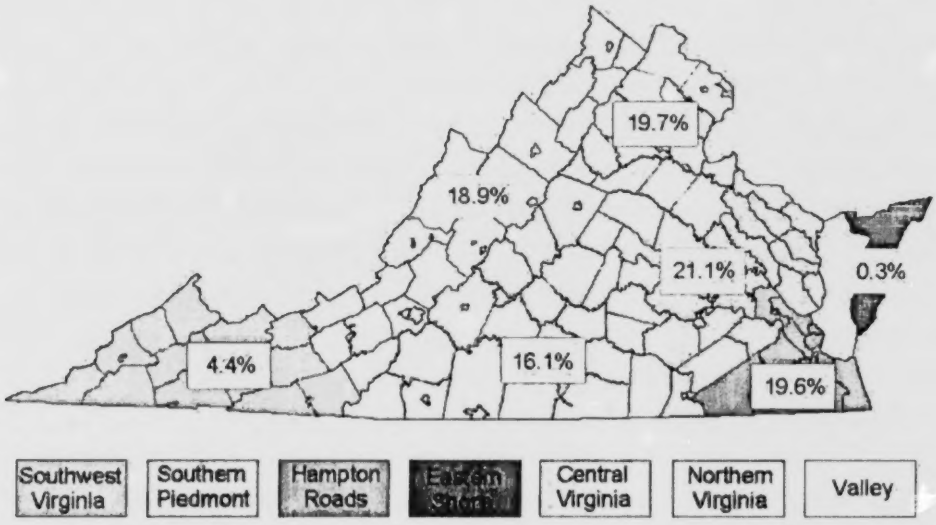

Figure 2-11: Private Non-Profit, Fall 2000 Service Area

Private For-Profit[19]

Virginia has fourteen private for-profit institutions of higher education. In fall 2000, these institutions enrolled 7,891 students, a 142 percent, or 4,630 student, increase over 1990 enrollment. Fifty-nine percent of these enrollments were comprised of in-state students, 54 percent were full-time, and 87 percent were undergraduate.[20] As shown in Figure 2-12, the overwhelming majority of these students were traditional, with the largest number falling between the ages of 20 and 24.[21]

[19] In this instance and all others within this report, "private for-profit" institutions refers only to those private for profit institutions incorporated within Virginia.
[20] *supra*, note 4.
[21] *ibid.*

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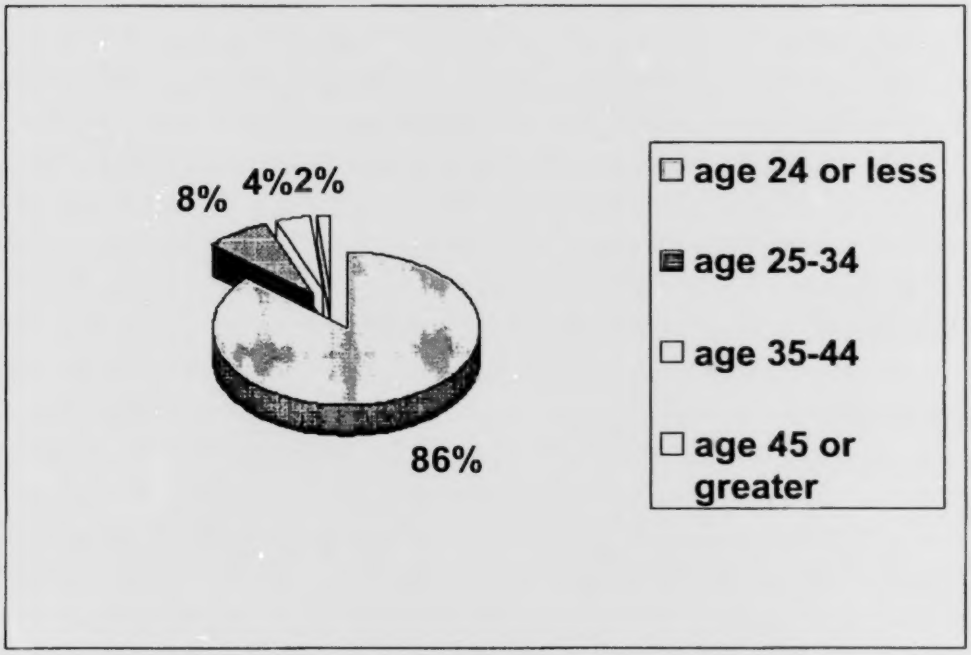

Figure 2-12: Private For-Profits, Age Distribution, Fall 2000 Headcount

Table 2-6 breaks these numbers down according to student level.

Table 2-6: Private For-Profits – Fall 2000 Headcount Enrollment by Student Level and Age

	24 or less	25 to 34	35 to 44	45 or greater
Freshman	96.5%	2.5%	0.7%	0.3%
Sophomore	90.5%	6.4%	2.2%	0.8%
Unclassified Undergraduate	17.1%	46.4%	31.6%	4.9%
Unclassified Graduate/First Professional	0.0%	43.5%	30.4%	26.1%
Graduate - First Year	1.9%	45.9%	30.3%	21.9%

Figure 2-13 breaks down fall 2000 enrollments in the private for-profit institutions by various race/ethnicity categories. As demonstrated by this pie chart, fall 2000 enrollments were 61 percent White, 34 percent Black, 3 percent

Asian or Pacific Islander, 2 percent Hispanic, and less than 1 percent Native American.[22]

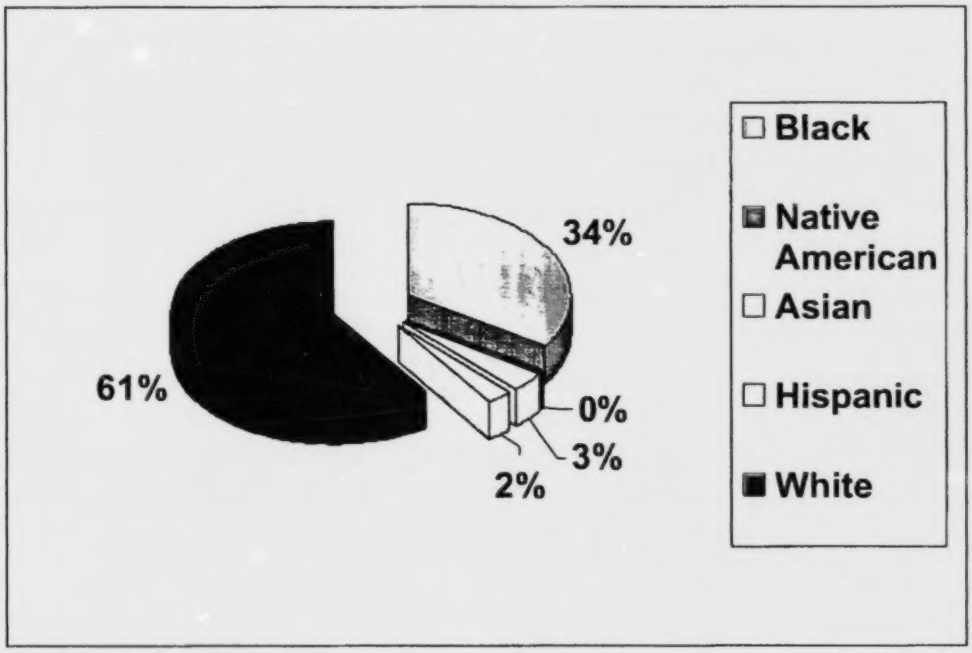

Figure 2-13: Private For-Profits, Race/Ethnicity Distribution, Fall 2000 Headcount

Figure 2-14 details the service area of the private for-profit institutions based on their fall 2000 in-state enrollments.[23] As demonstrated by this map, in fall 2000 the private for-profit institutions drew the vast majority of their in-state enrollments from the Hampton Roads (52 percent) and Central Virginia (31 percent) regions.

[22] *ibid.*
[23] *ibid.*

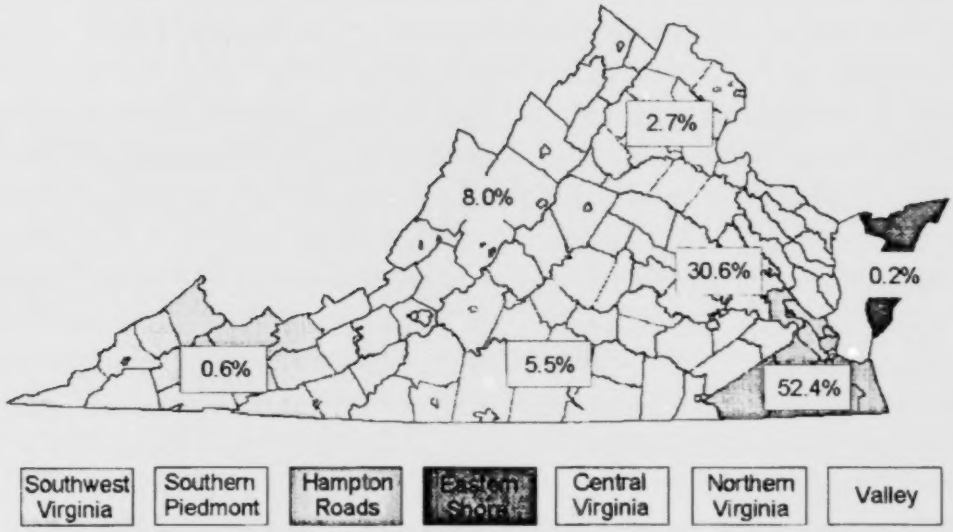

Figure 2-14: Private For-Profits, Fall 2000 Service Area

Summary: Where We Are

- Between 1990 and 2000, system-wide (public four-year, public two-year, private non-profit, and private for-profit) college and university enrollments in Virginia increased by 19,977 students, or six percent. Almost all of that increase occurred in the most recent period (since 1997).

- Enrollment did not increase evenly across all sectors. While enrollment in public four-year institutions of higher education increased by 15,542 students (10 percent), enrollment in public two-year institutions increased by 6,953 students (5 percent), and enrollment in private for-profit institutions increased by 4,630 students (142 percent), enrollment in private non-profit institutions decreased by 6,833 students (-12 percent). It is important to note, however, that the majority of the enrollment decline in the private non-profit institutions occurred at a single institution. Exclusive of that institution, the private non-profit institutions grew by 5,508 students (14 percent).

- Virginia residents comprise 78 percent of the student body at public four-year institutions, 94 percent at public two-year institutions, 53 percent at private non-profit institutions, and 59 percent at private for profit institutions.

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- Public four-year institutions and private non-profit institutions serve a largely full-time, degree seeking, "traditional" student population that is less than 24 years old. Alternatively, public two-year institutions serve a student population that is largely part-time and evenly divided between traditional-aged and non-traditional-aged students.

- Public four-year institutions draw 82 percent, and private for-profit institutions 85 percent, of their enrollment from the I-95/I-64 crescent in the eastern half of the Commonwealth. Whereas, the service area of public two-year institutions and private non-profit institutions tends to be more evenly distributed across the Commonwealth.

Where We Are Going

All projections can be likened to the Ghost of Christmas Future from Charles Dickens' play *A Christmas Carol* – they tell you what is likely to happen in the future if things continue on as they have up to today. If things do not continue on as they have, either by happenstance or because we decide to achieve a different future as Scrooge did, the future will diverge from the projection. Put simply, what we do in this section is take what we know (the student and institutional characteristics described in the previous section) and combine it with what we think we know (future changes in population) to shed light on what we would like to know (the direction and magnitude of future changes in enrollment demand).

Projected Virginia Population – 2000 to 2010

According to the most recently available U.S. Census Bureau projections, Virginia's population will increase by approximately 630,000, or 9 percent, between 2000 and 2010.[24] However, different demographic subgroups enroll in colleges and universities at different rates. For that reason, to gain a better understanding of the likely effect that this increase in population will have on enrollment demand, it is necessary to break it down into its component parts.

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[24] U.S. Bureau of the Census, *State Population Projections: 1995-2025*, 1996. These projections are derived using a cohort-component method. For a description of this method *see* Campbell, Paul R., 1996, *Population Projections for States by Age, Sex, Race, and Hispanic Origin: 1995 to 2025*, U.S. Bureau of the Census, Population Division, PPL-47. According to its current schedule, the U.S. Bureau of the Census does not expect to release revised population projections based on the 2000 census until sometime in 2002.

Age Groups

Based on SCHEV's comprehensive student enrollment database and U.S. Census data, we know that in the fall of 2000 approximately 18.5 percent of Virginia's 15 to 24 year olds, 5.8 percent of 25 to 34 year olds, 2.9 percent of 35 to 44 year olds, and 1.1 percent of those 45 years or older attended some Virginia institution of higher education (for a detailed listing of enrollment rates *see* Appendix 2-B).[25] Figure 2-15 graphically depicts the projected population increase between 2000 and 2010 for each of these age groups.[26] Although the 45 and older group is by far the largest (2.4 million in 2000) and the one projected to increase the most (652,000, or 27.3 percent, between 2000 and 2010), because of its low college enrollment rate, it is also the age group that is least likely to have a significant impact on enrollment demand.

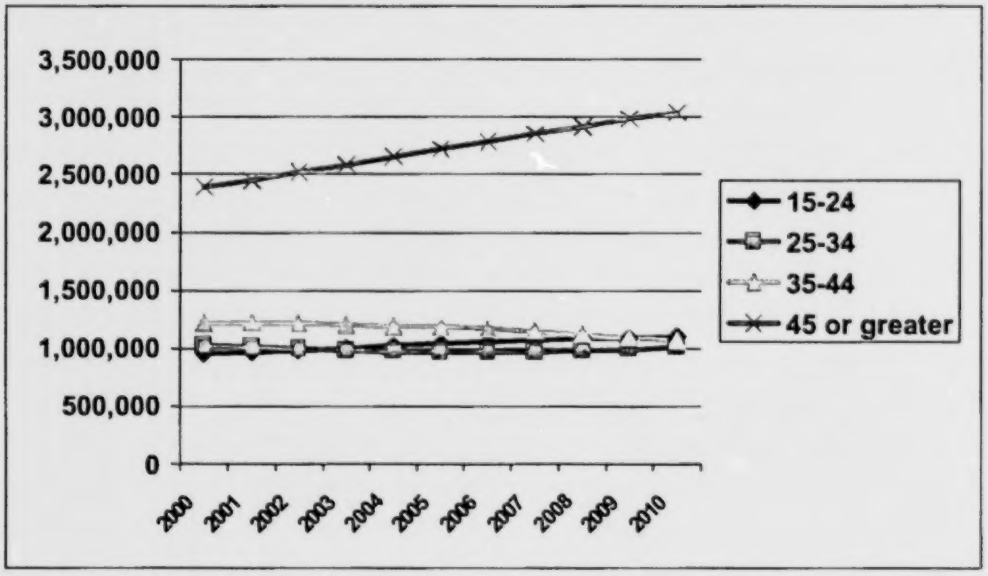

Figure 2-15: Projected VA Population Trends – 2000 to 2010

[25] Data source: SCHEV's student enrollment database and U.S. Bureau of the Census, *State Population Projections: 1995-2025*, Series A. U.S. Census projections for 2000 were used to compute the fall 2000 enrollment rates instead of the 2000 estimate to maintain consistency with the 1995-2025 Series A population projections used in the enrollment demand projection. The U.S. Bureau of the Census Series A projection is scheduled to be updated in 2002 to reflect 2000 census data.

[26] *supra*, note 24.

Figure 2-16 is identical to Figure 2-15 except that it excludes the 45 and older age category and focuses on those age groups that exhibit higher college enrollment rates. What this figure shows is that 15 to 24 year olds, the age group with by far the highest college enrollment rate (18.5 percent), is projected to increase steadily throughout the period. Overall, this group is projected to increase 16.5 percent, or 156,578, between 2000 and 2010. This demographic trend has significant implications for enrollment demand in Virginia. This is particularly true for undergraduate enrollments in the public four-year and private institutions of higher education, because these enrollments tend to be much more heavily weighted toward students within this age category.

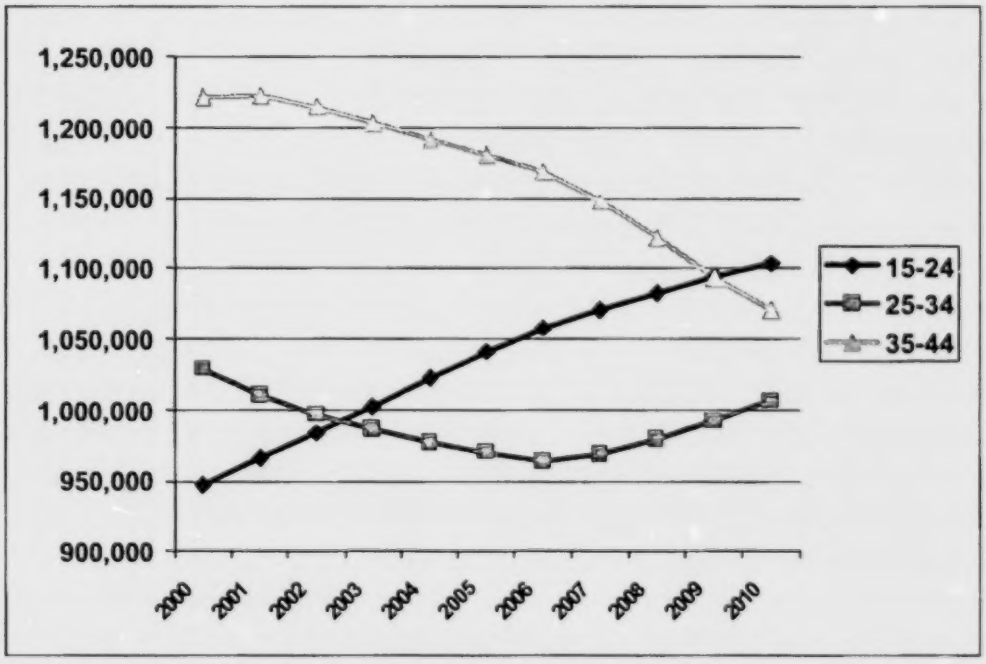

Figure 2-16: Projected VA Population Trends for 15-24, 25-34, and 35-44 age cohorts only – 2000 to 2010

Figure 2-16 also shows that the primary age cohorts from which institutions draw their non-traditional students – 25 to 34 year olds and 35 to 44 year olds – are both projected to decline in absolute number between 2000 and 2010. This remains true even though the number of 25 to 34 year olds is projected to rebound toward the end of the decade. Overall, 25 to 34 year olds are expected to decline by 2.2 percent, or 22,788, between 2000 and 2010 and 35 to 44 year olds by 12.3 percent, or 150,437. Recall that the college enrollment rate for 25 to 34 year olds

was 5.8 percent in fall 2000, whereas the enrollment rate for 35 to 44 year olds was 2.9 percent. These demographic trends also have significant implications for enrollment demand in Virginia. In this case, the sectors most likely to be affected are the community colleges, and the public four-year and private institution graduate programs, as these enrollments tend to include a large number of students within these age categories.

Race/Ethnicity Groups

We also know from an analysis of SCHEV's comprehensive student enrollment database and U.S. Census data, that different racial and ethnic groups exhibit different higher education enrollment rates. For example, from fall 2000 data we know that among Virginia residents in the 15 to 24 year old age group – the age group from which 61 percent of system-wide enrollments are drawn – approximately 40.0 percent of Native Americans, 28.7 percent of Asians and Pacific Islanders, 19.9 percent of Whites, 13.1 percent of Blacks, and 12.1 percent of Hispanics were enrolled in a Virginia institution of higher education.[27] Figure 2-17 takes the population projection for Virginia 15 to 24 year olds depicted in Figure 2-16 and breaks it down according to race and ethnicity.[28] According to these data, 86,053, or a little more than half, of the anticipated population increase of 156,578 in this age group between 2000 and 2010 is expected to come from the three racial and ethnic subgroups that exhibited the highest college enrollment rates in fall 2000.

[27] *supra*, note 25.
[28] *supra*, note 24.

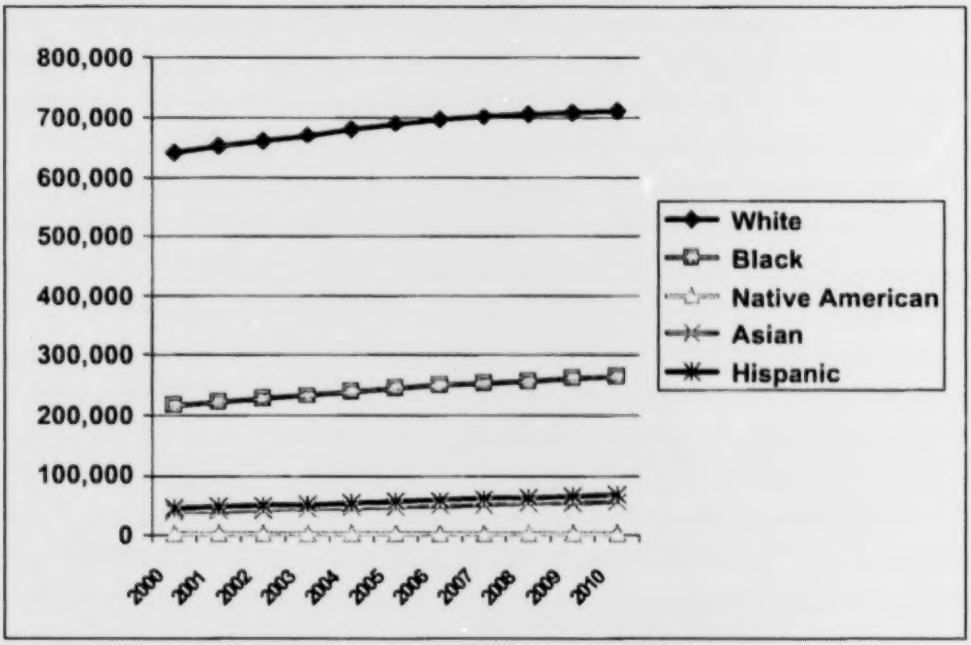

Figure 2-17: Projected Demographic Trends by Race/Ethnicity – Virginia 15 to 24 Year Olds

Taking a similar look at Virginia residents within the 25 to 34 year old category – which comprised 19.4 percent of system-wide enrollments in fall 2000 – we find that college enrollment rates by racial and ethnic subgroup in fall 2000 were approximately 15.7 percent for Native Americans, 9.3 percent for Asians and Pacific Islanders, 5.8 percent for Whites, 5.2 percent for Blacks, and 3.9 percent for Hispanics.[29] Figure 2-18 takes the population projection for Virginia 25 to 34 year olds depicted in Figure 2-16 and breaks it down according to race and ethnicity.[30] In this case we find that the three racial and ethnic subgroups exhibiting the highest college enrollment rates in fall 2000 are projected to decline by 41,510 between 2000 and 2010. This is nearly twice as much as the 22,788 total decline projected for 25 to 34 year olds over the period.

[29] *supra*, note 25.
[30] *supra*, note 24.

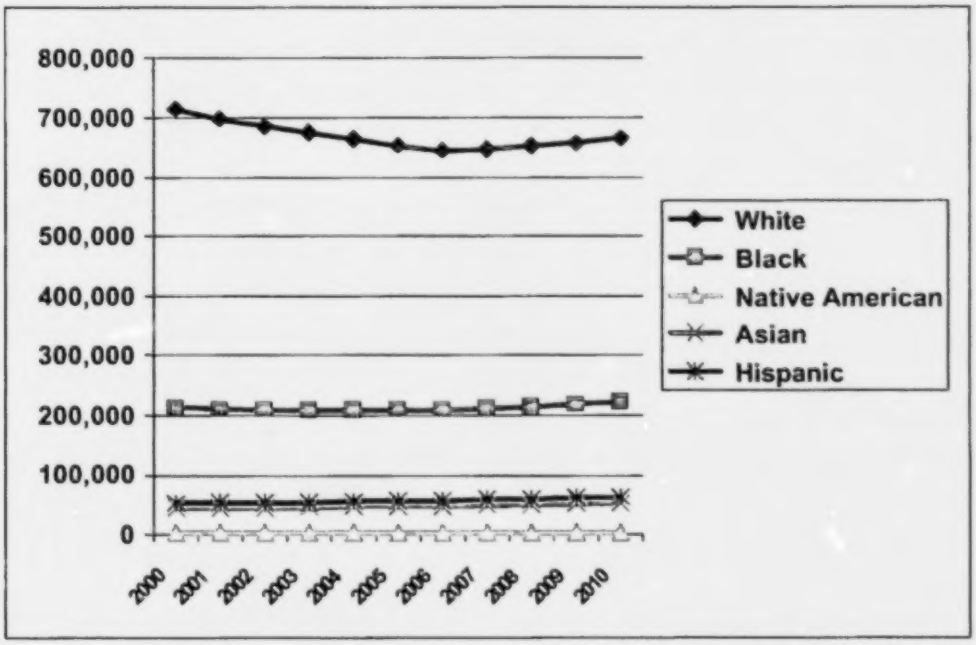

Figure 2-18: Projected Demographic Trends by Race/Ethnicity: Virginia 25 to 34 Year Olds

Figure 2-19 disaggregates the population projection for Virginia 35 to 44 year olds according to racial and ethnic subgroup.[31] Within this age category, that comprised 10.8 percent of system-wide enrollments in fall 2000, college enrollment rates were 7.3 percent for Native Americans, 3.2 percent for Blacks, 2.8 percent for Asians and Pacific Islanders, 2.8 percent for Whites, and 1.9 percent for Hispanics in fall 2000. Here the three racial and ethnic subgroups exhibiting the highest college enrollment rates in fall 2000 are projected to decline by 6,066, a small fraction of the total 150,437 decline projected for this age group between 2000 and 2010.

[31] *ibid.*

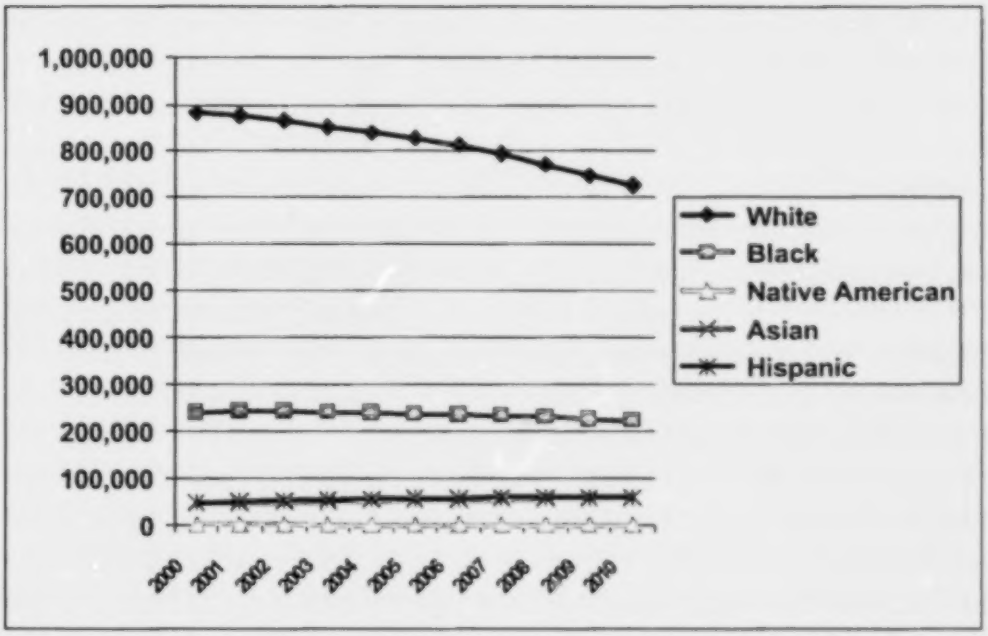

Figure 2-19: Projected Demographic Trends by Race/Ethnicity: Virginia 35 to 44 Year Olds

Regional

Unfortunately, the U.S. Bureau of the Census' state population projections are done at a statewide level and do not provide regional or county-level detail. However, there are other data sources available that allow us to shed some light on probable future differences in enrollment demand by region. Data produced by the Weldon Cooper Center for Public Service at the University of Virginia on the projected number of high school seniors by county indicate that between 2000 and 2005, the number of high school seniors will increase by 5,870 students statewide.[32] These data are significant because, as one might expect, changes in the number of high school graduates are strongly correlated with changes in the number of traditional students enrolled in institutions of higher education. A more striking finding in the Weldon Cooper data, however, is that a mere eight localities will be responsible for 91 percent of this growth, with most other localities exhibiting either stagnant or declining numbers of high school seniors. Each of those eight localities (Chesapeake, Chesterfield, Fairfax, Henrico, Loudoun,

[32] These data were presented at the February 9, 2001, SCHEV 2001 Enrollment Projection Workshop, by Dr. Michael A. Spar, Research Associate, Demographics and Workforce Section, Weldon Cooper Center for Public Service, University of Virginia.

Prince William, Spotsylvania, and Stafford) is located in the I-95/I-64 crescent of eastern Virginia.

Because, as was shown in the previous section *Where We Are*, different institutions draw their students from different parts of the Commonwealth, this high degree of regional concentration in the growth of high school seniors is likely to have differential effects on enrollment demand. For instance, recall from the earlier section that, whereas public four-year institutions draw 82 percent, and private for-profit institutions 86 percent, of their in-state enrollments from the I-95/I-64 crescent, public two-year institutions draw only 67 percent, and private non-profit institutions only 60 percent of their in-state enrollments from that portion of the Commonwealth. Figure 2-20 focuses more precisely on this issue by ranking institutions according to the proportion of their in-state enrollment drawn from the eight aforementioned high-growth localities.

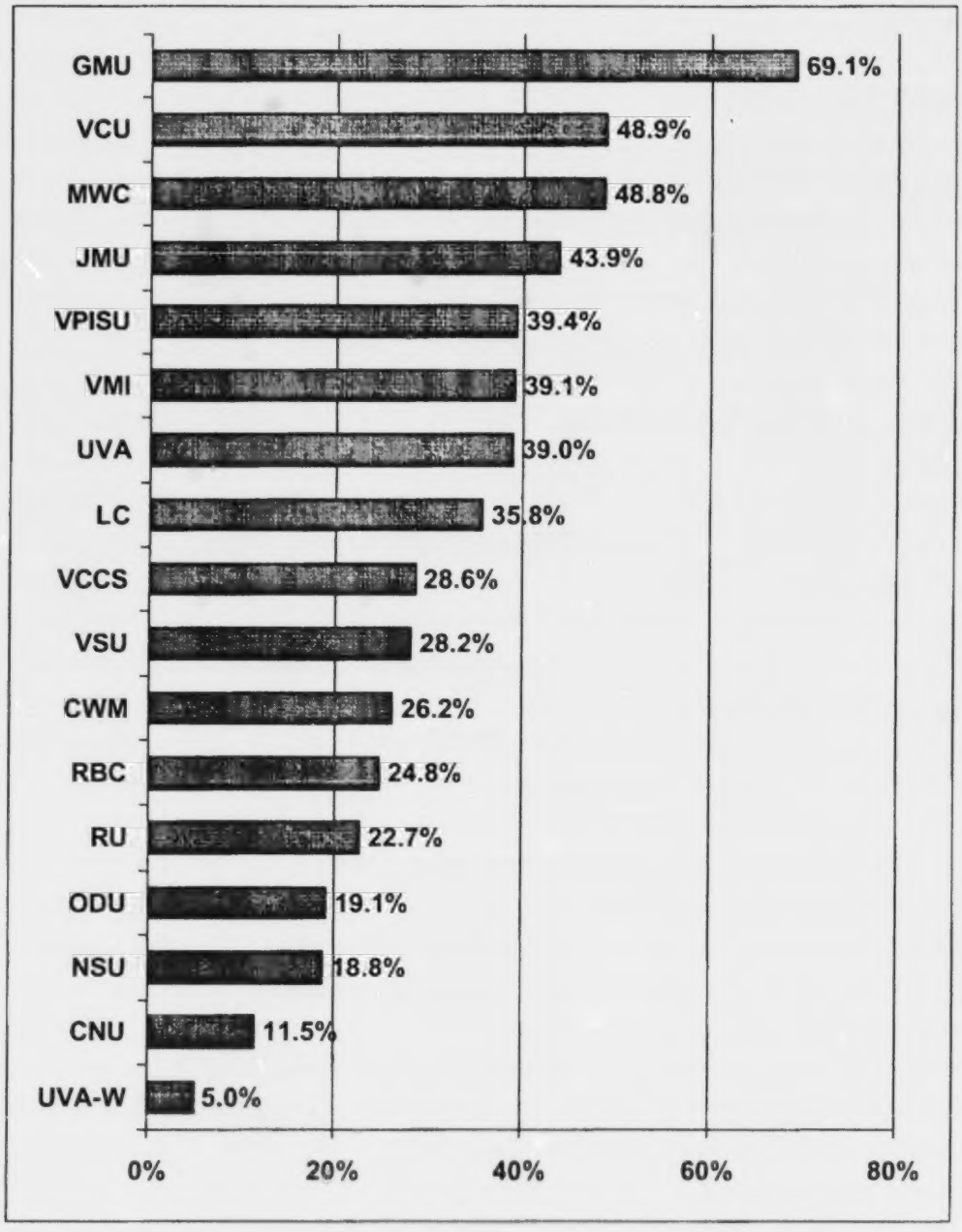

Figure 2-20: Percentage of Fall 2000 In-State Enrollment Drawn from the Eight Highest Growth Localities

Enrollment Demand Projection for 2001 through 2010

The enrollment demand projections presented below are derived using data from SCHEV's comprehensive student-specific enrollment database and U.S. Bureau of the Census, Series A, state population projections. The enrollment demand projections are done at a statewide level for each of the four sectors within Virginia's system of higher education (public four-year, public two-year, private non-profit, and private for-profit). Because of data constraints, slightly different methods were used to project enrollment demand for public and private institutions of higher education. A detailed description of those methods is provided in Appendix 2-C.

Before proceeding, however, a few caveats are in order. First, SCHEV's enrollment demand model relies heavily on population projections provided by the U.S. Bureau of the Census. The most current population projections available from the U.S. Bureau of the Census were completed in 1996 and are based on updated data from the 1990 census. State population projections based on 2000 census data will not be available before 2002.

Second, the U.S. Bureau of the Census' state population projections are done at a statewide level and do not provide regional or county level detail. This means that the enrollment demand projections presented herein do not reflect regional differences in population growth. The practical importance of this data limitation is that enrollment demand projections for those sectors that disproportionately draw their students from the fastest growing portions of the state (*i.e.*, the public four-year institutions and the private for-profit institutions) are likely to somewhat understate actual enrollment demand. Alternatively, enrollment demand projections for those sectors that tend to draw a larger proportion of their students from the slower growing portions of the state (*i.e.*, the public two-year institutions and the private non-profit institutions) are likely to somewhat overstate actual enrollment demand.

Third, SCHEV's enrollment demand projection implicitly relies in part on the assumption that college enrollment rates for various age and racial/ethnic groups will remain constant at fall 2000 levels throughout the forecast horizon of 2001-2010. Although, as can be seen from Appendix 2-B, enrollment rates have in fact generally remained fairly consistent in recent years, to the extent that they increase or decrease in the future, the projection will tend to understate or overstate future estimates of enrollment demand.

Finally, SCHEV's enrollment demand projection is also implicitly dependent, in part, on the assumption that the number of institutions of higher education in each sector (four-year public, two-year public, private non-profit, and

private for-profit) will remain largely constant at fall 2000 levels. This assumption is fairly consistent with historical reality in all sectors except one – the private for-profit institutions. Because these institutions have significantly grown in number in recent years and can reasonably be anticipated to continue to do so in the future, it is probable that our estimate of future enrollment demand for this sector is understated.

Public Four-Year Institutions

Our model projects that enrollment demand for Virginia's public four-year institutions of higher education will increase from 175,742 headcount students (equivalent to approximately 133,794 regular session full-time-equivalent (FTE)) in fall 2000 to approximately 194,641 headcount students (148,182 regular session FTE) in fall 2010. This is an increase of 18,899 students, or 11 percent. This projection is depicted graphically in Figure 2-21, with details provided in Table 2-7.

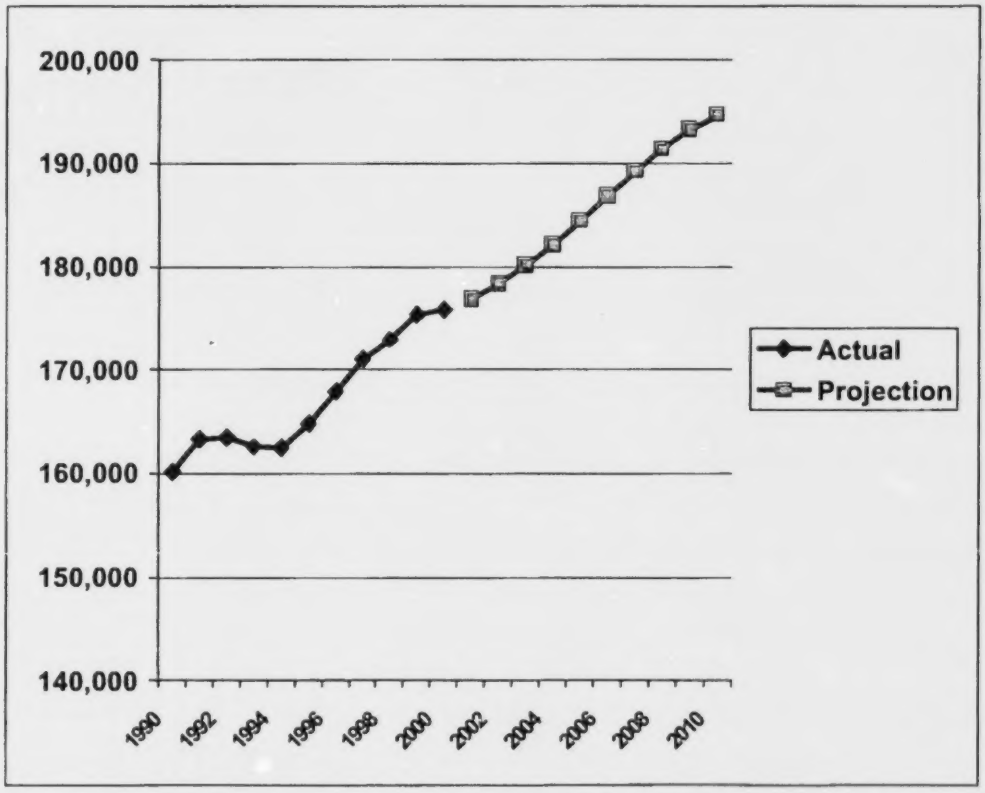

Figure 2-21: 4 yr. Publics, Enrollment Demand Fall 2001-2010

Table 2-7: 4 yr. Publics, Enrollment Demand, Fall 2001-2010

Year	2001-02	2002-03	2003-04	2004-05	2005-06
Fall Headcount	176,821	178,264	180,017	182,094	184,421
Change from 2000 (abs.)	1,079	2,522	4,275	6,352	8,679
Change from 2000 (%)	0.6%	1.4%	2.4%	3.6%	4.9%

Year	2006-07	2007-08	2008-09	2009-10	2010-11
Fall Headcount	186,866	189,236	191,389	193,241	194,641
Change from 2000 (abs.)	11,124	13,494	15,647	17,499	18,899
Change from 2000 (%)	6.3%	7.7%	8.9%	10.0%	10.8%

Year	2001-02	2002-03	2003-04	2004-05	2005-06
Regular Session FTE	134,615	135,714	137,049	138,630	140,401
Change from 2000 (abs.)	821	1,920	3,255	4,836	6,607
Change from 2000 (%)	0.6%	1.4%	2.4%	3.6%	4.9%

Year	2006-07	2007-08	2008-09	2009-10	2010-11
Regular Session FTE	142,263	144,067	145,706	147,116	148,182
Change from 2000 (abs.)	8,469	10,273	11,912	13,322	14,388
Change from 2000 (%)	6.3%	7.7%	8.9%	10.0%	10.8%

The projection model also provides important information about the characteristics of these students. First, they will tend to be younger. Recall from Figure 2-3 that in fall 2000, 69 percent of the enrollment in Virginia's public four-year institutions was comprised of "traditional" students 24 years of age or younger. As indicated in Figure 2-22, by 2010 this percentage will change to 72 percent. This means that roughly 13,607 out of this 18,899 headcount student increase in enrollment demand will fall in the "traditional" age category. This is significant because, as earlier stated, traditional students enrolled in four-year institutions are more likely to live on campus and more likely to be enrolled as full-time, degree-seeking students. As a result, they are more likely to place significant demands on an institution's capital resources (dormitory, instructional, and recreational space).

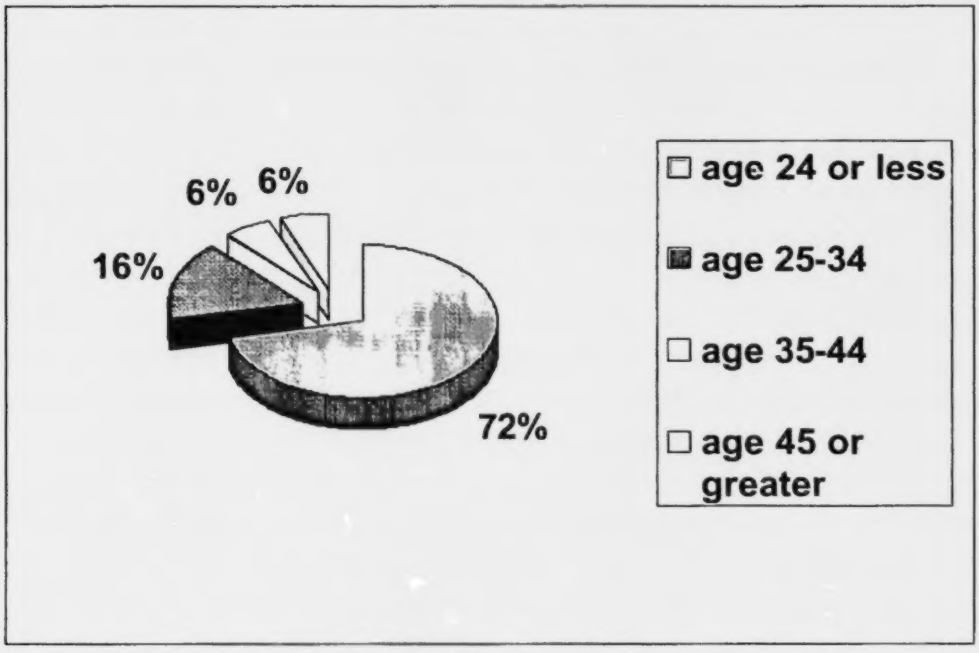

Figure 2-22: 4 yr. Publics, Age Distribution, Fall 2010 Headcount

A second characteristic of 2010 enrollment is that students will tend to be more diverse. A comparison of Figure 2-23 with Figure 2-4 shows that, whereas minority racial and ethnic groups comprised 26 percent of enrollment in the public four-year institutions in fall 2000, they will likely comprise 28 percent in fall 2010. The largest proportional change will take place among Asians and Pacific Islanders, a group that exhibited one of the highest college enrollment rates in fall 2000.

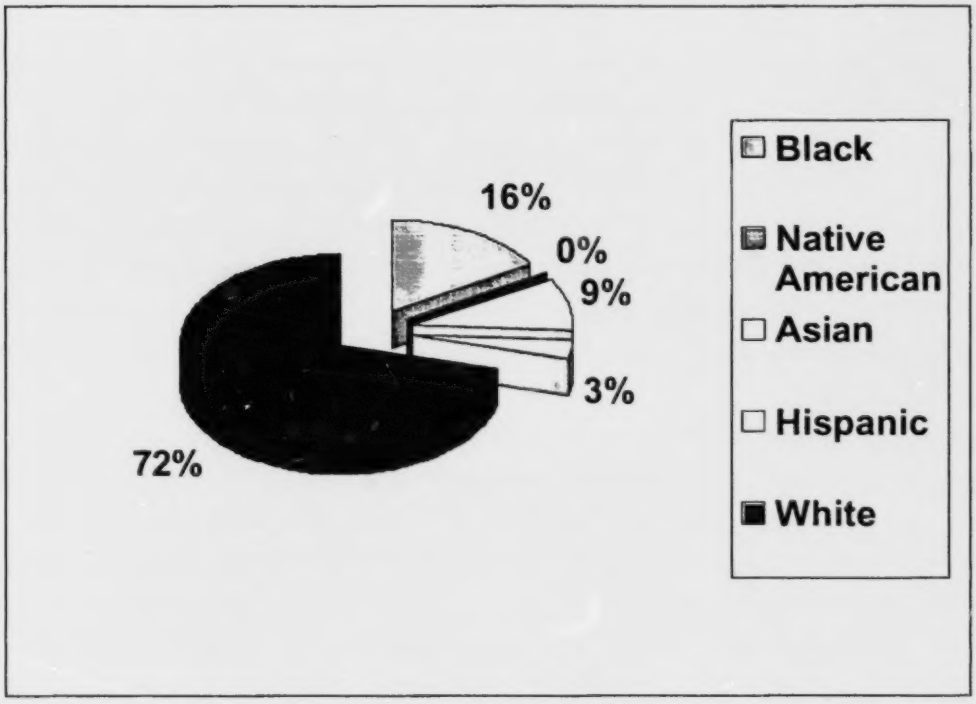

Figure 2-23: 4 yr. Publics, Race/Ethnicity Distribution, Fall 2010 Headcount

Public Two-Year Institutions

As shown graphically in Figure 2-24 and numerically in Table 2-8, enrollment demand in public two-year institutions is expected to increase from 138,039 headcount students (62,595 regular session FTE) in fall 2000 to 150,751 headcount students (68,359 regular session FTE) in fall 2010. This is an increase of 12,712 headcount students (5,764 regular session FTE), or 9 percent. The lower expected growth in enrollment demand for the public two-year institutions, relative to the public four-year institutions, is largely attributable to the fact that the public two-year institutions draw a larger proportion of their enrollment from age groups that are projected to experience declining population between 2000 and 2010. In addition, because of changes in racial/ethnic composition, one of the age groups from which the public two-year institutions draw a significant number of their students – the 25 to 34 year olds – is also likely to exhibit a decline in overall college enrollment rates between 2000 and 2010.

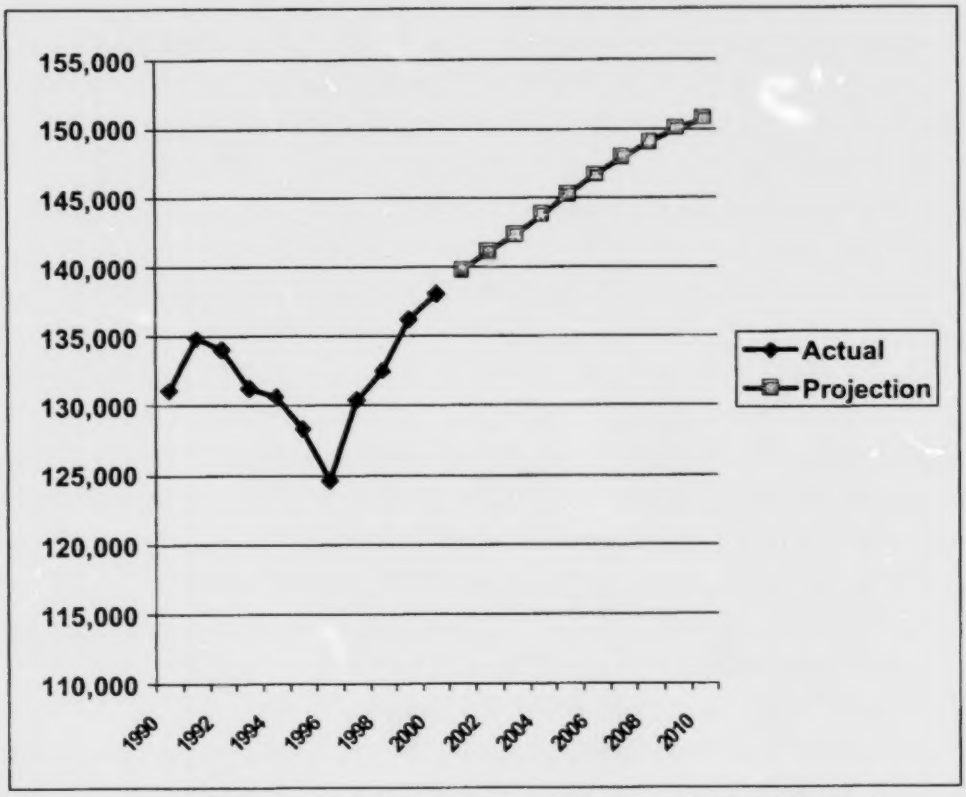

Figure 2-24: 2 yr. Publics, Enrollment Demand Fall 2001-2010

Table 2-8: 2 yr. Publics, Enrollment Demand, Fall 2001-2010

Year	2001-02	2002-03	2003-04	2004-05	2005-06
Fall Headcount	139,759	141,072	142,333	143,738	145,215
Change from 2000 (abs.)	1,720	3,033	4,294	5,699	7,176
Change from 2000 (%)	1.2%	2.2%	3.1%	4.1%	5.2%

Year	2006-07	2007-08	2008-09	2009-10	2010-11
Fall Headcount	146,639	147,896	148,997	149,981	150,751
Change from 2000 (abs.)	8,600	9,857	10,958	11,942	12,712
Change from 2000 (%)	6.2%	7.1%	7.9%	8.7%	9.2%

Year	2001-02	2002-03	2003-04	2004-05	2005-06
Regular Session FTE	63,375	63,970	64,542	65,179	65,849
Change from 2000 (abs.)	780	1,375	1,947	2,584	3,254
Change from 2000 (%)	1.2%	2.2%	3.1%	4.1%	5.2%

Year	2006-07	2007-08	2008-09	2009-10	2010-11
Regular Session FTE	66,495	67,065	67,564	68,010	68,359
Change from 2000 (abs.)	3,900	4,470	4,969	5,415	5,764
Change from 2000 (%)	6.2%	7.1%	7.9%	8.7%	9.2%

Figures 25 and 26 detail the probable age and racial/ethnic composition of public two-year enrollments in 2010. A comparison of these figures with Figures 6 and 7 above reveals that the public two-year institutions will also be serving a younger (the proportion of traditional aged students will likely increase from 50 to 54 percent) and more diverse (minority enrollment will likely increase from 30 to 32 percent) student body in fall 2010 than they did in fall 2000.

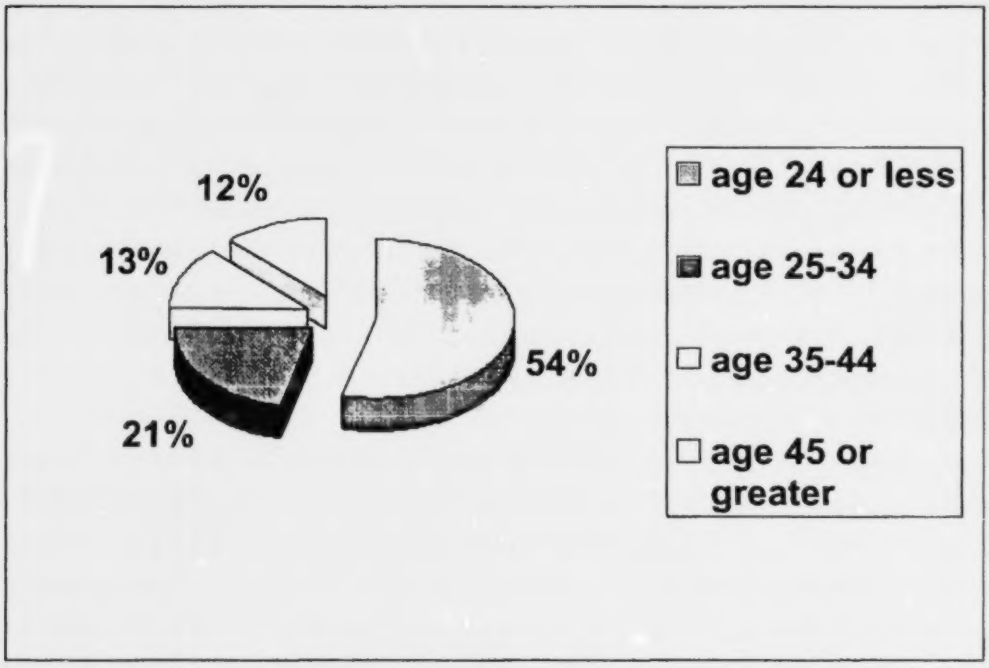

Figure 2-25: 2 yr. Publics, Age Distribution, Fall 2010 Headcount

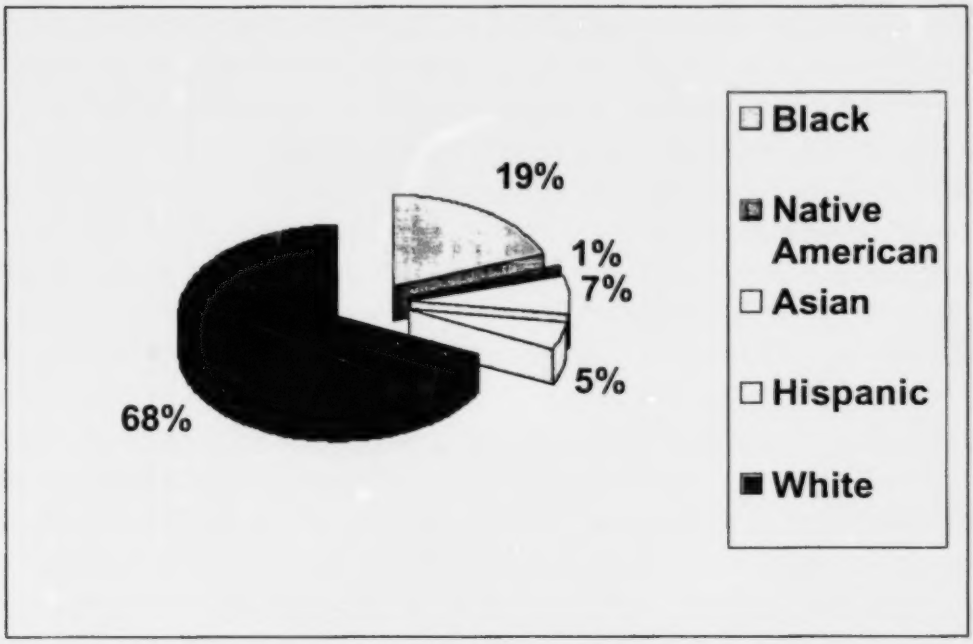

Figure 2-26: 2 yr. Publics, Race/Ethnicity Distribution, Fall 2010 Headcount

Private Non-Profit Institutions

SCHEV's enrollment demand model projects that enrollment demand in the private non-profit institutions will increase from 50,635 headcount students (46,368 regular session FTE) in fall 2000 to 56,203 headcount students (51,473 regular session FTE) in 2010. This is an increase of 5,568 headcount students (5,143 regular session FTE) or 11 percent. Figure 2-27 graphically displays this increase, with numeric detail provided in Table 2-9. In this case, the reason that the private non-profit institutions are projected to grow at a faster rate than the public four-year institutions is because they draw a larger proportion of their students from the traditional age group – 24 years of age or less. Recall that this age group is expected to grow significantly in population between 2000 and 2010 and also exhibits a high college enrollment rate. At the same time, however, it is important to remember in reference to the second caveat discussed at the beginning of this section that the private non-profit institutions also tend to draw a larger proportion of their enrollment from the slower growing regions of the state. For this reason, and because SCHEV's enrollment demand model is based on U.S. Bureau of the Census population projections that are statewide and do not account

for regional differences in population growth rates, it is likely that a portion of the increase in enrollment demand projected for the private non-profit institutions will actually manifest itself in the public four-year institutions instead.

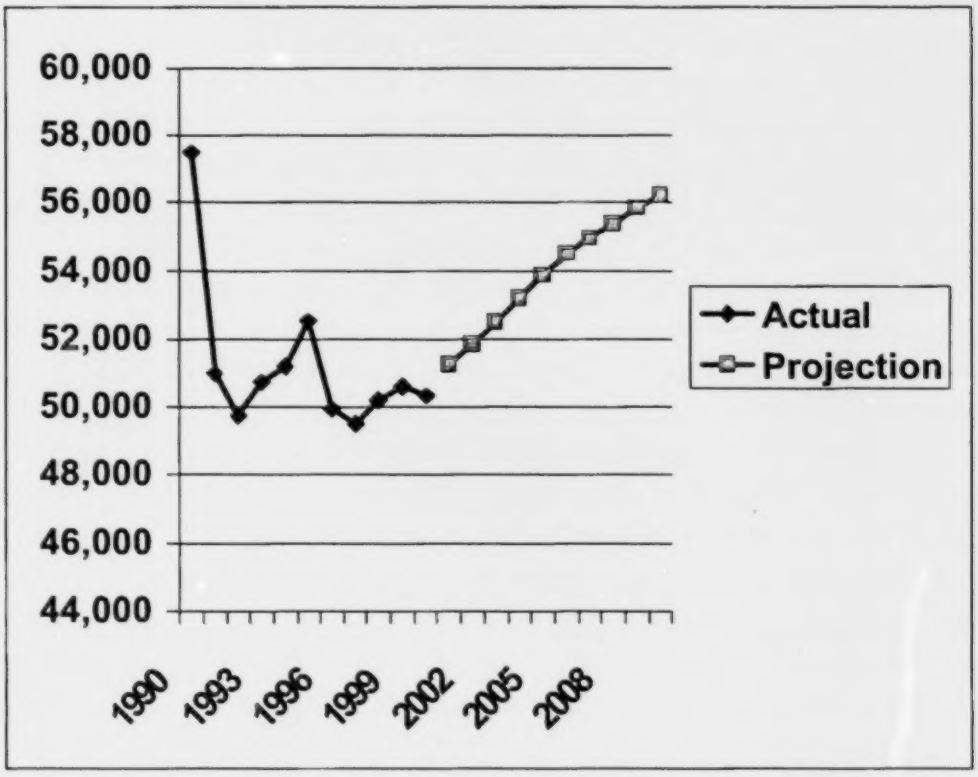

Figure 2-27: Private Non-Profits, Enrollment Demand Fall 2001-2010

Table 2-9: Private Non-Profits, Enrollment Demand, Fall 2001-2010

Year	2001-02	2002-03	2003-04	2004-05	2005-06
Fall Headcount	51,237	51,828	52,488	53,187	53,855
Change from 2000 (abs.)	602	1,193	1,853	2,552	3,220
Change from 2000 (%)	1.2%	2.4%	3.7%	5.1%	6.4%

Year	2006-07	2007-08	2008-09	2009-10	2010-11
Fall Headcount	54,485	54,952	55,384	55,840	56,203
Change from 2000 (abs.)	3,850	4,317	4,749	5,205	5,568
Change from 2000 (%)	7.7%	8.6%	9.4%	10.3%	11.1%

Year	2001-02	2002-03	2003-04	2004-05	2005-06
Regular Session FTE	46,925	47,466	48,071	48,711	49,323
Change from 2000 (abs.)	556	1,112	1,715	2,364	2,967
Change from 2000 (%)	1.2%	2.4%	3.7%	5.1%	6.4%

Year	2006-07	2007-08	2008-09	2009-10	2010-11
Regular Session FTE	49,899	50,327	50,723	51,140	51,473
Change from 2000 (abs.)	3,568	3,985	4,358	4,776	5,143
Change from 2000 (%)	7.7%	8.6%	9.4%	10.3%	11.1%

Figures 28 and 29 detail the probable age and racial/ethnic composition of fall 2010 enrollments in the private non-profit institutions. Here again, a comparison with the earlier Figures for fall 2000 (Figures 9 and 10) shows that fall 2010 enrollments will tend to be both younger and more diverse than in fall 2000.

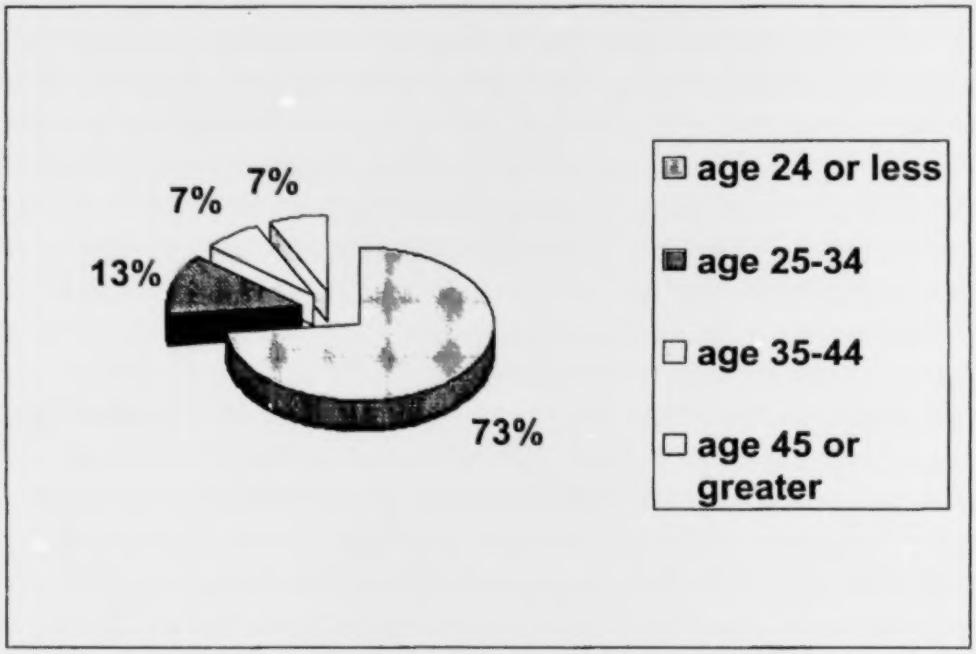

Figure 2-28: Private Non-Profits, Age Distribution, Fall 2010 Headcount

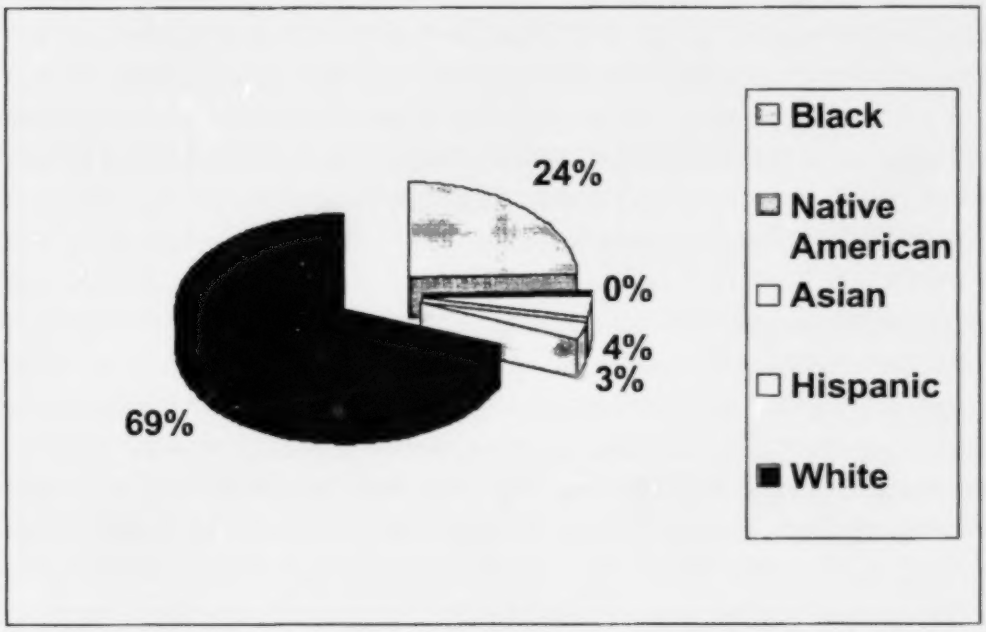

Figure 2-29: Private Non-Profits, Race/Ethnicity Distribution, Fall 2010 Headcount

Private For-Profit Institutions

Enrollment demand for the private for-profit institutions is projected to increase from 7,891 students in fall 2000 to 9,008 students in 2010. This is an increase of 1,117 students or 14 percent.[33] The reason private for-profit institutions are projected to experience the largest increase in enrollment demand is that they draw the greatest proportion of their students from the traditional age group – 24 years of age or less. Moreover, because the number of institutions in this sector may continue to increase, actual enrollment demand for private for-profit institutions may be greater than projected. Future enrollment demand for the private for-profit institutions is depicted graphically in Figure 2-30 and numerically in Table 2-10.

[33] SCHEV does not collect full time equivalent (FTE) student data for the private for-profit institutions.

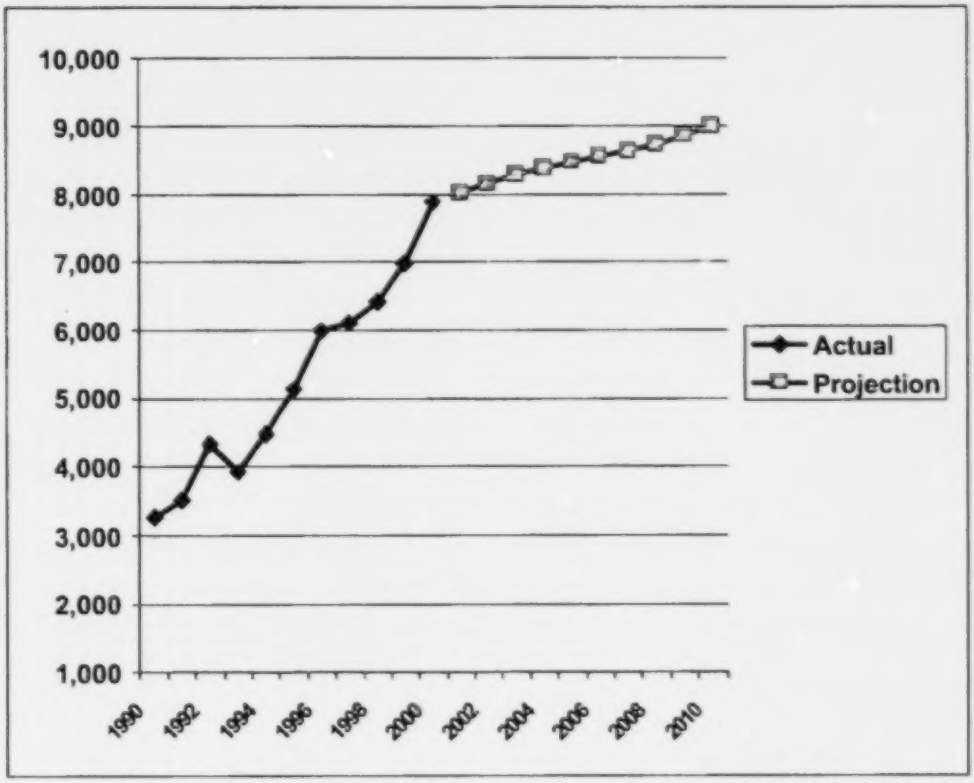

Figure 2-30: Private For-Profits, Enrollment Demand Fall 2001-2010

Table 2-10: Private For-Profits, Enrollment Demand, Fall 2001-2010

Year	2001-02	2002-03	2003-04	2004-05	2005-06
Fall Headcount	8,021	8,155	8,287	8,387	8,469
Change from 2000 (abs.)	130	264	396	496	578
Change from 2000 (%)	1.6%	3.3%	5.0%	6.3%	7.3%

Year	2006-07	2007-08	2008-09	2009-10	2010-11
Fall Headcount	8,561	8,640	8,738	8,866	9,008
Change from 2000 (abs.)	670	749	847	975	1,117
Change from 2000 (%)	8.5%	9.5%	10.7%	12.4%	14.2%

As demonstrated by a comparison of Figures 31 and 32 with Figures 12 and 13, fall 2010 enrollments in the private for-profit institutions will also tend to be younger and more diverse than in fall 2000.

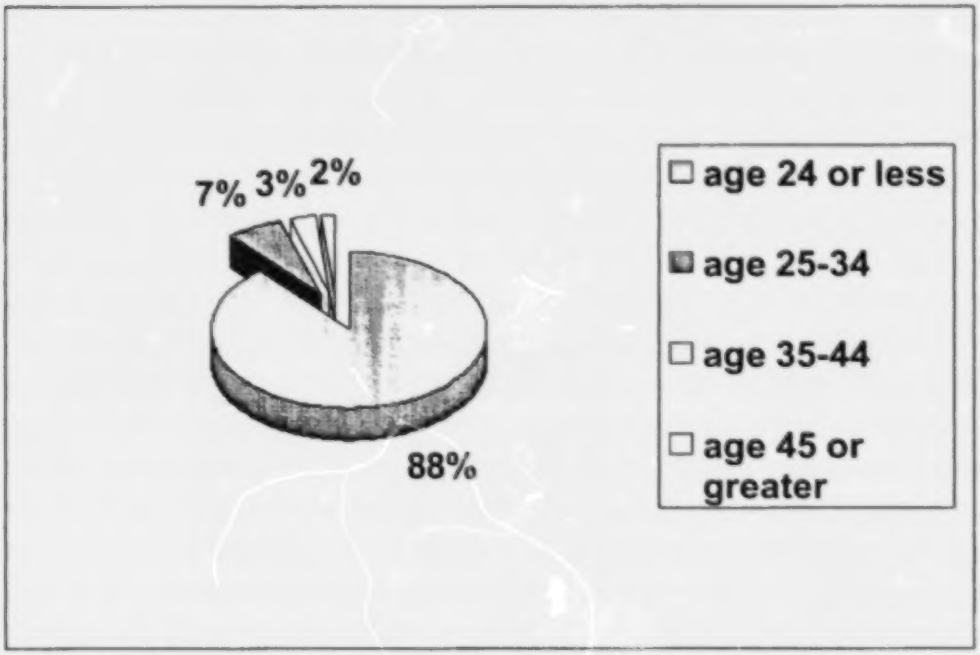

Figure 2-31: Private For-Profits, Age Distribution, Fall 2010 Headcount

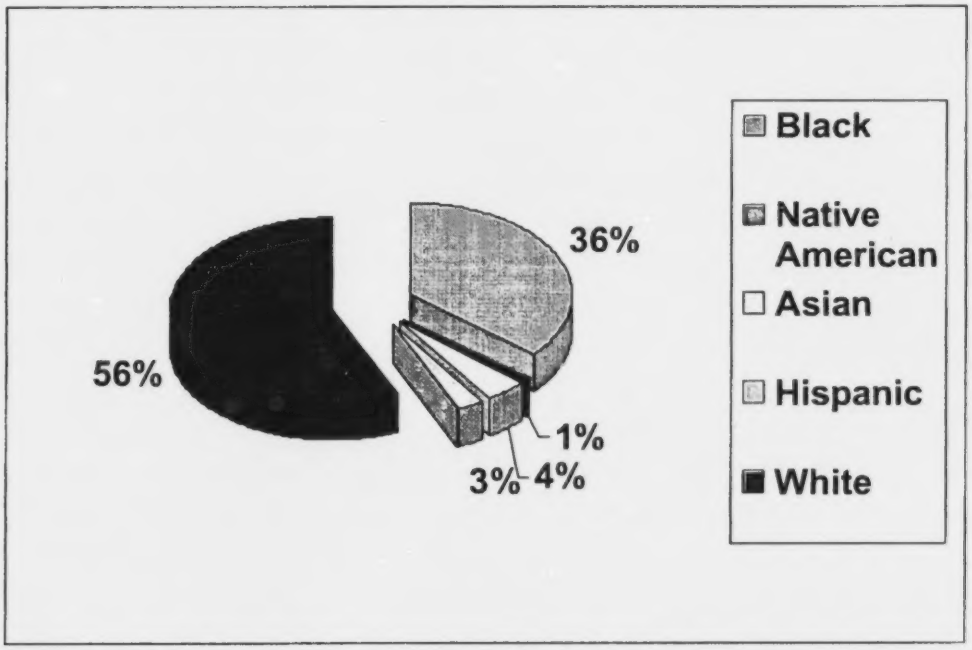

Figure 2-32: Private For-Profits, Race/Ethnicity Distribution, Fall 2010 Headcount

Summary: Where We Are Going

- The population of 15 to 24 year olds in Virginia is expected to increase by 156,578 between 2000 and 2010. This "traditional" college age group exhibits the highest college enrollment rate (18.5 percent of Virginians in the 15 to 24 age group attended a Virginia institution of higher education in fall 2000) and comprised 86 percent of enrollments in private for profit, 71 percent in private non-profit, 69 percent in public four-year, and 50 percent in public two-year institutions in fall 2000.

- The population of 25 to 34 year olds in Virginia is expected to decline by 22,788 between 2000 and 2010. 5.8 percent of Virginians in this age group attended a Virginia institution of higher education in fall 2000 and this age group accounted for 23 percent of public two-year enrollment, 18 percent of public four-year, 14 percent of private non-profit, and 8 percent of private for-profit. In addition, among 25 to 34 year olds, the population of those racial and ethnic groups that exhibit the highest college enrollment rates is expected to decline by 41,510 between 2000 and 2010 – almost twice the decline for the age group as a whole. This implies that, in addition to declining in absolute number between 2000 and 2010, the average college enrollment rate for 25 to 34 year olds is likely to decline as well.

- The population of 35 to 44 year olds in Virginia is expected to decline by 150,437 between 2000 and 2010. However, this group exhibits a relatively low college enrollment rate (2.9 percent in fall 2000) and comprised only 16 percent of public two-year, 9 percent of private non-profit, 8 percent of public four-year, and 4 percent of private for-profit enrollments in fall 2000.

- Because the U.S. Bureau of the Census' state population projections used in SCHEV's enrollment demand model do not contain regional detail, the enrollment demand model does not take into account likely regional differentials in population growth. We know from Weldon Cooper Center estimates of the future number of high school seniors, however, that only eight counties – all within the I-95/I-64 crescent – will account for 91 percent of the growth in the number of high school seniors between 2000 and 2005. The private for-profit and the public four-year institutions respectively draw 85 and 82 percent of their in-state enrollments from the I-95/I-64 crescent, whereas the private non-profit and public two-year institutions draw only 61 and 67 percent respectively.

- SCHEV's enrollment demand model projects that between 2000 and 2010 enrollment demand will increase: 1) 18,899 students, or 10.8 percent, in the

public four-year institutions, 2) 12,712 students, or 9.2 percent, in the public two-year institutions, 3) 5,568 students, or 11.0 percent, in the private non-profit institutions, and 4) 1,117 students, or 14.1 percent, in the private for-profit institutions. These increases are driven largely by the number of students that each sector draws from the rapidly growing 15 to 24, or traditional, age group.

- Across all sectors of Virginia's higher education system, enrollments are likely to become younger and more diverse between 2000 and 2010.

Summary

- In this chapter we detail where Virginia's system of higher education is today, and where it will likely be in 2010, with respect to the demand for higher education.

- Between 2000 and 2010, enrollment demand (undergraduate and graduate) across Virginia's system of higher education (public four-year, public two-year, private non-profit, and private for-profit institutions) will increase by approximately 38,296 students. The public institutions will account for 83 percent of this increase, or approximately 31,611 students. This contrasts with a 19,977 student increase in system-wide enrollment, and 22,495 student increase in public college and university enrollment, over the period from 1990 to 2000.

- This increase in enrollment demand is being driven in the main by a significant increase in the number of 15 to 24 year olds in Virginia. This "traditional" college age group has a high college enrollment rate (18.5 percent Virginians 15 to 24 years old attended a Virginia institution of higher education in fall 2000) and is responsible for the bulk of college and university enrollments (86 percent in private for profit institutions, 71 percent in private non-profit, 69 percent in public four-year, and 50 percent in public two-year institutions in fall 2000). Also important is the fact that almost all of this growth will take place in a handful of localities all located in the Interstate 95/Interstate 64 (I-95/I-64) crescent in the eastern portion of the Commonwealth.

- At the same time that Virginia's population of 15 to 24 year olds will be increasing, its population of 25 to 44 year olds will be declining. This is the age group that drives "non-traditional" enrollments in Virginia's colleges and universities.

- Those institutions of higher education whose institutional missions are primarily geared toward serving "traditional" students, and that draw a large proportion of their students from the I-95/I-64 crescent in the eastern portion of the Commonwealth, are likely to experience the greatest increase in enrollment demand. The one category of institutions that fits both of these criteria is the public four-year colleges and universities.

Chapter 3 – Enrollment Capacity

Introduction

As part of its biennial system-wide review and prioritization of higher education capital outlay projects, SCHEV uses guidelines that measure the adequacy of each public college and university's current and planned inventory of instructional and academic support building space relative to its enrollment. In this chapter of the System-Wide Needs Assessment, we build on that process to develop baseline estimates of enrollment capacity for instructional and academic support space at Virginia's public four-year, public two-year, and private non-profit institutions of higher education. These estimates are an essential addition to the enrollment demand estimates detailed in Chapter 2, because, neither estimate alone is sufficient to provide policy makers the information necessary to make strategic planning decisions. It is only through a comparison of the two that we can identify when, where, and to what extent the Commonwealth faces challenges in meeting future enrollment growth. It is important to note, however, that the analysis presented in this chapter is intended to provide an overall view of the capacity of the system to absorb additional students. It is not intended to inform decisions on the capital needs of any one college or university.

Assessing Enrollment Capacity

Background

In response to significant increases in higher education enrollment after World War II, states began implementing quantitative benchmarks for determining facility space needs on the basis of projected enrollment. In the ensuing years, this approach has become fairly standard. According to a 1999 study conducted by MGT of America, higher education systems in 26 states, including Virginia, were at that time using quantitative standards for calculating the need for additional classrooms and class labs.[34] These same standards can be used to quantitatively assess enrollment capacity for instructional and academic support space. In essence, we simply turn the telescope around. Instead of applying space guidelines to projected enrollment to determine the amount of additional instructional and academic support space needed for the future, we apply the same

[34] *Space Standards for Selected States' Higher Education Systems*, MGT of America, Inc., 1999.

standards to existing instructional and academic support space to determine the level of enrollment that can currently be accommodated.

Typically, quantitative space need assessments employ two metrics – space guidelines and utilization guidelines. Space guidelines specify the average amount of instructional and academic support space, measured in assignable square feet, required for each full time equivalent student (FTE).[35] Often, separate guidelines are used for different categories of space (*e.g.*, classrooms and class labs) and, sometimes, for different categories of enrollment (*e.g.*, graduate, undergraduate, and/or by academic discipline). Utilization guidelines refer to how intensively classroom and class lab space is used. These guidelines generally specify the number of hours per week a classroom or class lab should be scheduled (*e.g.*, 40 hours per week), the proportion of stations (seats) that should be filled (*e.g.*, classes should be large enough that at least 60 percent of the seats in the classroom are filled), and/or a combined measure of the number of hours per week that stations should be used (*e.g.*, 40 hours per week of classroom use times 60 percent capacity equals 24 hours per week of station use).

One problem with this approach, however, is that it does not always take into account the full range of factors that can affect enrollment capacity. For example, although space guidelines are typically used to assess the "core" categories of space used for delivery of instructional services (*i.e.*, classrooms, class labs, and faculty offices), there are other categories of space (*e.g.*, dormitories, maintenance, library, research, food service) or kinds of infrastructure (*e.g.*, water and sewer systems) that can place binding constraints on the number of students that an institution can adequately accommodate. Also, some institutions have separate campus sites that are used for specialized categories of enrollment (*e.g.*, George Mason's Arlington Campus or the University of Virginia's North Grounds) and are not easily available to accommodate general enrollment. In addition, it is sometimes difficult to develop space guidelines from a system perspective that fully reflect the unique mission or culture of individual colleges and universities.

SCHEV Method for Assessing Enrollment Capacity

To control for some of the limitations of the quantitative analysis of enrollment capacity, while still benefiting from its strengths, SCHEV has employed two methods to assess the enrollment capacity of Virginia's colleges

[35] FTE is a mathematical abstract that indicates the number of students that would be enrolled in an institution if each student were taking a full course load (*e.g.*, two students taking half loads are equivalent one FTE student).

and universities – quantitative analysis and survey analysis. Both are detailed below.

Quantitative Assessment

SCHEV has for many years used space need and utilization guidelines to assess the need for proposed capital projects in Virginia's public colleges and universities. These guidelines were most recently revised in July 2001.[36] The Council uses space need guidelines to assess the need for four major space categories: 1) instruction and academic support, 2) research, 3) student services and institutional support, and 4) operation and maintenance of physical plant. Because instruction and academic support are the "core" categories of space used to deliver instructional services, this guideline is the one most often used by states for quantitatively assessing enrollment capacity.

As seen in Figures 3-1 and 3-2, in fall 2000 instruction and academic support space comprised 44 percent of educational and general space in the public four-year institutions and 65 percent in the community colleges. Instruction and academic support is comprised of space used for general academic instruction, vocational/technical instruction, educational media services, academic computing services, academic administration, and course and curriculum development. SCHEV's current space need guideline for instruction and academic support space provides for 42.5 to 50.0 assignable square feet per regular session FTE "depending on the institution's programs and disciplines."[37]

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[36] *Guidelines for Higher Education Fixed Assets for Educational and General Programs*, SCHEV, July, 2001. This document is available at www.schev.edu under "Policies and Guidelines."
[37] *Ibid.*, p.2.

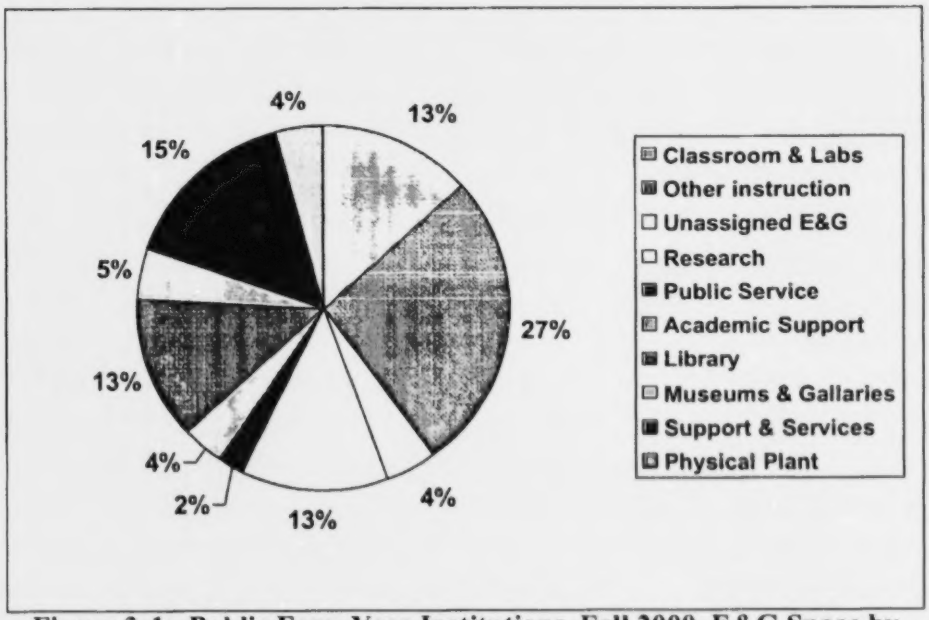

Figure 3-1: Public Four-Year Institutions, Fall 2000, E&G Space by Program

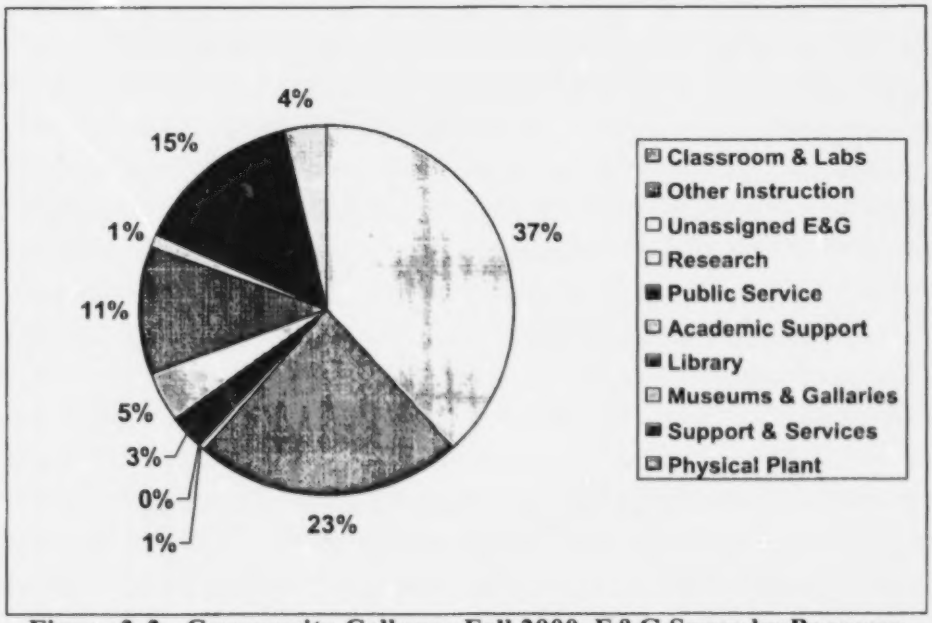

Figure 3-2: Community Colleges, Fall 2000, E&G Space by Program

SCHEV's current guideline for classroom utilization is an average of 24 hours per week of class station (seat) use.[38] This guideline is based on the prescriptive assumption that classrooms are used an average of 40 hours a week at a 60 percent occupancy rate. The guideline for class lab utilization is an average of 18 hours per week of class station use. This guideline is based on the prescriptive assumption that class labs are used an average of 24 hours a week at a 75 percent occupancy rate.

SCHEV used both the space need and utilization guidelines as a starting point for its quantitative analysis of enrollment. However, in conducting this analysis, SCHEV further refined the space need guideline for instruction and academic support space to more explicitly address differences across institutions in academic discipline and program mix. Although the existing guideline acknowledges that different academic disciplines require differing amounts of space, it does so passively. The approach we have taken in assessing enrollment capacity for the System-Wide Needs Assessment is more proactive.

[38] *Ibid.*, p.13.

Specifically, we break down the existing space need guideline for instructional and academic support space into three component parts – classrooms and class labs, other instructional space, and academic support space – and look at each part separately. Then, using data reported by the public institutions as part of the 2002-2004 capital budget process which provide room-by-room detail on how each public college and university uses its space, we develop measures of the "typical" amount of space that institutions use to accommodate enrollment.

For the last two components of the space need guideline – other instructional space and academic support space – the analysis consisted of a straightforward comparison of the amount of space each institution allocated to each of these categories and their student enrollment.[39] However, because differences in institutional mission are more clearly reflected in different requirements for classroom and class lab space (*e.g.*, differences in academic programs, program or institution size, emphasis on graduate education, emphasis on research, and utilization all drive differences in classroom and class lab space requirements), SCHEV conducted a more detailed analysis of the typical amount of space required for classrooms and class labs.

To determine the typical amount of space required for classrooms and class labs, SCHEV made use of additional data supplied by the institutions that provide hour-by-hour detail on how each college and university uses its classroom and class lab space and the intensity with which they are used. Based on these data, SCHEV developed space need benchmarks for classrooms and class labs that measure the typical amount of space, system-wide, that institutions use to serve students in specific academic disciplines.[40] These benchmarks provide separate information for classrooms and class labs and undergraduate and graduate instruction. In addition, they control for existing economies/diseconomies of scale – circumstances where the average amount of space required per student decreases/increases as the total number of students increases. In sum, they provide a quantitative basis for differentiating among institutions according to each institution's:

- mix of academic disciplines,
- proportion of undergraduate and graduate enrollment,
- proportion of classrooms and class labs, and
- scale of enrollment.

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[39] For a listing of the Other Instruction and Academic Support Space Need Guidelines, *see* Appendix 3-D.
[40] For a listing of the discipline-specific space need benchmarks for Classrooms and Class Labs, *see* Appendix 3-E.

In order to take into account the fact that some institutions use their space more intensively than others, SCHEV produced two sets of discipline-specific space need benchmarks for classrooms and class labs. In the first we take current classroom and class lab utilization rates as given. The enrollment capacity assessment produced using these benchmarks provides an estimate of what the system's classroom and class lab capacity would be if institutions continue to use their space at the same level of intensity that they do now. In the second, we adjust the benchmarks to reflect the classroom and class lab space that would be required if all institutions were meeting SCHEV's utilization guidelines which, it should be noted, are among the most stringent in the country.[41] The enrollment capacity estimate produced using these benchmarks is a "best-case-scenario" estimate of what system-wide capacity for classrooms and class labs would be if all institutions were using their space as optimally as the guideline requires.

Once the discipline-specific space need benchmarks for classrooms and class labs were derived, we applied them to each college and university's enrollment, broken down by academic discipline, to obtain a separate classroom and class lab guideline for each institution that reflects the unique mission of that institution. We then combined these guidelines with the guidelines for other instruction and academic support space and applied them to each institution's current and planned inventory of space to estimate current and future system-wide enrollment capacity. For this purpose, we include in "planned" space only those projects within the current six-year capital planning horizon (2001 to 2006) that have been both approved and funded. A full description of the method SCHEV used to develop its quantitative assessment of enrollment capacity of instructional and academic support space is provided in Appendix 3-A. The results from quantitative enrollment capacity analysis are discussed in the section entitled *Findings*.

Survey Analysis

In addition to the quantitative analysis of enrollment capacity, SCHEV also surveyed colleges and universities to identify potential constraints on enrollment growth that were not captured in the quantitative analysis of instructional and academic support space. The survey asked three open-ended questions. The first was – *what general level of future enrollment would be consistent with the institution's mission?* The second was – *does the institution face binding constraints to enrollment growth that are not reflected in the quantitative*

[41] According to MGT's 1999 survey, *Space Standards for Selected States' Higher Education Systems*, only four states had classroom utilization standards that were more stringent than Virginia's.

analysis? The third was – *could the institution increase in-state enrollment by reducing out-of-state enrollment?* The purpose of the survey was to provide a more complete picture of the system's capacity to accommodate additional enrollment and the conditions under which that accommodation could occur.

The responses from this survey were used to supplement the quantitative assessment by identifying potential binding constraints (*e.g.*, dormitory space) on enrollment capacity that are not addressed in the quantitative analysis of instructional and academic support space. A copy of the actual survey instrument is provided in Appendix 3-B and a summary of the most salient findings from the survey analysis is provided in the following section entitled *Findings*.

Findings

Public Four-Year Institutions – Quantitative Analysis[42]

Using the method discussed in the previous section, SCHEV has refined the enrollment capacity analysis by replacing the current "one-size-fits-all" guideline with an alternative set of measures that empirically differentiate among institutions on the basis of mission. If we take current classroom and class lab utilization rates in the public four-year colleges and universities as given, the average of the institution-specific space need guidelines derived from this approach is 48.5 assignable square feet per regular session FTE.

Applying these institution-specific guidelines to the instructional and academic support space reported for FY 2001 and FY 2006 yields an estimated enrollment capacity in the public four-year institutions of 131,036 regular session FTE in FY 2001 and 134,166 in FY 2006.[43] If we compare these estimates to actual and projected enrollments in the four-year public institutions, in the aggregate we find that the public four-year institutions: 1) could have accommodated approximately 575 additional regular session FTE (752 headcount students) in FY 2001, 2) will face a net enrollment capacity deficit of approximately -3,429 regular session FTE (-4,487 headcount students) in FY

[42] Because of its unique mission, and unique requirements, relative to other Virginia public four-year institutions, Virginia Military Institute (VMI) is excluded from the quantitative assessment of enrollment capacity. From a practical perspective, this means that, for purposes of the quantitative assessment, VMI's enrollment capacity is assumed to be equivalent to its current enrollment.

[43] In contrast to the enrollment demand projection provided in Chapter 2 that provided estimates for FY 2002 through FY 2011, because of data availability we are only able to provide enrollment capacity estimates for FY 2001 and FY 2006.

2006, and 3) assuming no additional space beyond that currently planned, will face a net enrollment capacity deficit of approximately -11,055 regular session FTE (-14,466 headcount students) in FY 2011.[44]

A functional feature of these aggregate estimates of surplus or deficit, however, is that they are "net" – they implicitly assume that a capacity surplus in one institution "cancels out" a capacity deficit in another institution. Although, as shown in Chapter 2, there is in some cases substantial overlap in the geographic areas from which public four-year institutions draw their students, it is still unrealistic to assume that capacity across institutions is perfectly fungible. As a result, there is some rationale for looking at surpluses and deficits separately. Because the enrollment demand projection presented in Chapter 2 does not provide institution-level detail, however, it is only possible to do this for FY 2001 where we have benefit of actual data. Disaggregating the estimated enrollment capacity surplus of 575 regular session FTE for FY 2001, we find that five institutions (George Mason University, James Madison University, Old Dominion University, Radford University, and the Virginia Polytechnic Institute) are estimated to have had a combined capacity deficit of approximately -6,379 regular session FTE (-8,347 headcount students) for that year. Further, it is significant to note that these five "capacity deficit" institutions also account for 96 percent of the $222 million recommended for new instructional and academic support space for public four-year institutions in SCHEV's recent 2002-2004 capital budget recommendation (the remaining $587 million of SCHEV's $809 million recommendation for the public four-year institutions is for new space in areas outside of instruction and academic support, renovation projects, or other capital infrastructure needs).

In contrast to the preceding analysis, if we adjust the data to reflect the amount of space that would be required if all institutions were fully meeting SCHEV's utilization guidelines, the average of the institution-specific space need guidelines for the four-year public institutions is reduced from 48.5 to 46.7 assignable square feet per regular session FTE. The reason for this reduction is that system-wide classroom station use in the public four-year institutions is 22 weekly hours, or 8 percent less than SCHEV's 24 weekly hour guideline, and system-wide class lab station is 15 weekly hours, or 17 percent less than SCHEV's 18 weekly hour guideline.[45] As a result, adjusting the data to correspond to the

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[44] Estimated FY 2001 regular session FTE in the public four-year institutions is 130,461, and projected regular session FTE for FY 2006 and FY 2011, as derived from the enrollment demand projection presented in Chapter 2, are 137,595 and 145,221 respectively.

[45] A complete listing of classroom and class lab utilization rates by institution is provided in the SCHEV publication *2000 Space Utilization Report*, July 2001. This report is available from SCHEV's web site at

space that would be required if institutions were filling classrooms and class labs to the level prescribed in the SCHEV guidelines reduces the overall amount of space required.

Applying these adjusted institution-specific guidelines to reported instructional and academic support space, we estimate enrollment capacity in the four-year public institutions to be approximately 134,966 regular session FTE in FY 2001 and 138,212 in FY 2006. It follows then that, according to this "best-case-scenario" approach the four-year public institutions: 1) could have accommodated approximately 4,505 additional regular session FTE (5,895 headcount students) in FY 2001, 2) could accommodate approximately 617 more regular session FTE (807 headcount students) in FY 2006, and 3) assuming no additional space beyond that currently planned, will face a net enrollment capacity deficit of approximately -7,009 regular session FTE (-9,172 headcount students) in FY 2011. If we also disaggregate this revised "net" estimate for FY 2001, we find the same five institutions – George Mason University, James Madison University, Old Dominion University, Radford University, and the Virginia Polytechnic Institute – are estimated to have had a combined capacity deficit of approximately -5,112 regular session FTE (-6,689 headcount students) for that year.

Figure 3-3 provides a graphical representation of the estimated net enrollment capacity surplus/deficit in the public four-year institutions derived from both approaches – holding classroom and class lab utilization constant at current levels and assuming universal adherence to SCHEV's classroom and class lab utilization guidelines.

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www.schev.edu. In addition, a listing of the classroom and class lab station use rates used in this analysis is provided in Appendix 3-C.

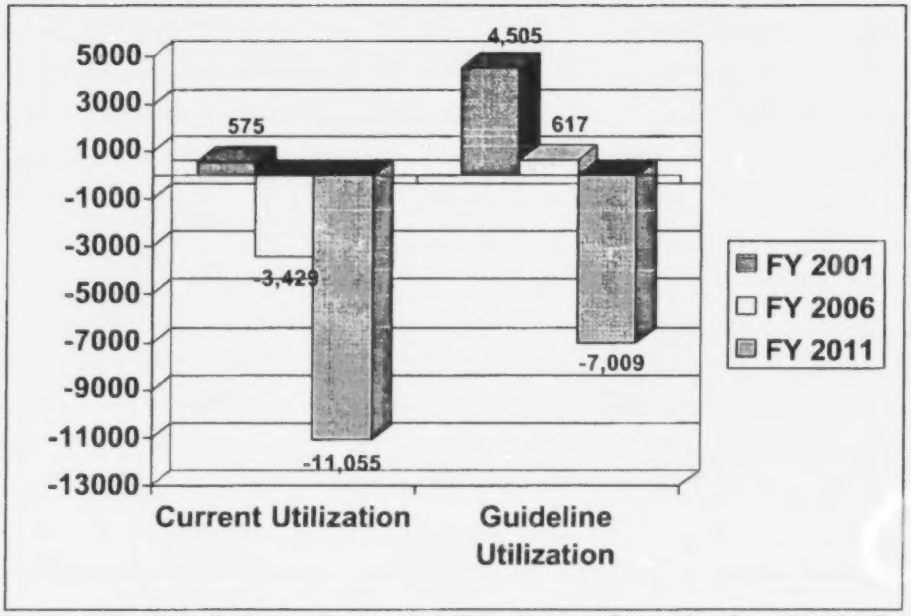

Figure 3-3: 4 yr. Publics, Estimated Enrollment Capacity Surplus/Deficit (regular session FTE)

Public Four-Year Institutions – Survey Analysis

To augment the quantitative findings presented in the previous section, SCHEV also surveyed the public four-year institutions to: 1) determine whether the institutions foresaw binding constraints on enrollment capacity that were not addressed in the quantitative analysis, 2) identify any additional resources that would be required to accommodate growth, and 3) determine whether institutions would be able to accommodate additional increases in in-state enrollment by adjusting their in-state to out-of-state enrollment ratios.

In their survey responses, five of Virginia's public four-year institutions – George Mason University, Longwood College, Old Dominion University, Radford University, and Virginia Commonwealth University – indicated that significant enrollment growth is consistent with their missions. Moreover, the optimal enrollment levels identified by these institutions are such that they would accommodate the total increase in enrollment demand that SCHEV projects for the public four-year institutions between 2001 and 2010.

However, these institutions, as well as other public four-year institutions, also indicated that they face significant obstacles to increasing enrollment.

Specifically, three of the five institutions – George Mason University, Old Dominion University, and Radford University – indicated that they already face space deficits and that additional capital investment will be necessary to address current enrollment, as well as future enrollment growth. It should be noted that these reported needs are consistent with the quantitative analysis presented in the preceding section and further supported by the base budget adequacy analysis recently released by the General Assembly's Joint Subcommittee Studying Higher Education Funding Policies which recommended additional operating funding for each of these institutions. In addition, the survey responses from many institutions indicate that additional investment would be required to address issues pertaining to:

- needed renovations,
- insufficient dormitory and dining facility space,
- insufficient telecommunications and facilities infrastructure ,
- insufficient library space,
- limited available land that can be used for growth,
- insufficient support for student services,
- inadequate base funding (including number of faculty, appropriate mix of part-time and full-time faculty), and
- inadequate support for operation and maintenance of physical plant.

Finally, in regard to the issue of changing in-state to out-of-state student ratios in order to accommodate greater in-state enrollment, James Madison University indicated that it would be willing to accept a larger proportion of in-state students if the state provided resources to compensate for lost tuition and fee revenue.

Public Two-Year Institutions – Quantitative Analysis[46]

As with the public four-year institutions, if we use the revised method developed by SCHEV, and take current classroom and class lab utilization rates in the community colleges as given, the average of the resulting institution-specific space need guidelines is 41.7 assignable square feet per regular session FTE. Applying these institution-specific guidelines to the instructional and academic support space the community colleges reported for FY 2001 and FY 2006, we

[46] Because of its unique mission relative the community colleges, Richard Bland College (RBC), Virginia's only public two-year junior college, is excluded from the quantitative assessment of enrollment capacity. From a practical perspective, this means that, for purposes of the quantitative assessment, RBC's enrollment capacity is assumed to be equivalent to its enrollment.

estimate enrollment capacity to be approximately 61,134 regular session FTE in FY 2001 and 63,992 in FY 2006. Comparing these numbers to actual and projected enrollment we find that the community colleges: 1) faced a net -704 regular session FTE (approximately -1,557 headcount student) enrollment capacity deficit in FY 2001, 2) will face a net -1,059 regular session FTE (approximately -2,342 headcount student) enrollment capacity deficit in FY 2006, and 3) assuming no additional space beyond that currently planned, will face a net enrollment capacity deficit of -3,539 regular session FTE (approximately -7,827 headcount students) in FY 2011.[47]

It is important to note, however, that whereas the public four-year institutions do in some cases exhibit substantial overlap in the geographic areas from which they draw their students, the community colleges, because of their community-based mission, do not. Consequently, it is very unlikely that enrollment capacity surpluses in one community college will serve to "cancel out" enrollment capacity deficits in another. Disaggregating the -704 regular session net capacity deficit for FY 2001, we find that eight institutions – Blue Ridge, Germanna, Northern Virginia, Piedmont Virginia, Southside Virginia, Thomas Nelson, Tidewater, and Virginia Western Community College – are estimated to have had a combined capacity deficit of -7,161 regular session FTE (approximately -15,839 headcount students) for that year. In addition, three of the eight institutions estimated to have had a capacity deficit in FY 2001 – Germanna, Northern Virginia, and Tidewater Community College – serve at least one of the eight localities (Chesapeake, Chesterfield, Fairfax, Henrico, Loudoun, Prince William, Spotsylvania, and Stafford) that are likely to account for 91 percent of the growth in the number of high school seniors in Virginia between 2000 and 2005.[48] These three institutions are estimated to have had a combined enrollment deficit of -5,483 regular session FTE (approximately -12,128 headcount students) in FY 2001. In this instance as well, it is significant to note that the Virginia Community College System accounts for $105 million (32 percent) of the $327 million recommended for new instructional and academic support space in SCHEV's recent 2002-2004 capital budget recommendation.

Another characteristic of the community colleges is that they typically exceed SCHEV's utilization guidelines. According to recent data, system-wide classroom station use in the community colleges is 25 weekly hours, or 4 percent greater than SCHEV's 24 weekly hour guideline, and system-wide class lab station use in the community colleges is 23 weekly hours, or 28 percent greater

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[47] Actual and projected enrollments in the community colleges are estimated to be 61,838 regular session FTE in FY 2001, 65,051 in FY 2006, and 67,531 in FY 2011.

[48] Data on projected high school seniors were provided by Dr. Michael A. Spar, Research Associate, Demographics and Workforce Section, Weldon Cooper Center for Public Service, University of Virginia.

than SCHEV's 18 weekly hour guideline. As a result, adjusting the data to reflect the amount of space that would be needed if the community colleges' reduced their utilization rates to the guideline level, actually increases the amo unt of space required.

If we make these adjustments, the average of the institution-specific space need guidelines for the community colleges increases from 41.7 to 43.1 assignable square feet per regular session FTE. Applying these guidelines to the instructional and academic support space reported for FY 2001 and FY 2006 provides an enrollment capacity estimate of approximately 58,827 regular session FTE in FY 2001 and 61,568 in FY 2006. If we compare these numbers to actual and projected enrollment for FY 2001 and FY 2006, we find that the community colleges: 1) experienced a net enrollment capacity deficit of approximately -3,011 regular session FTE (-6,660 headcount students) in FY 2001, 2) will face a net enrollment capacity deficit of approximately -3,483 regular session FTE (-7,704 headcount students) in FY 2006, and 3) assuming no additional space beyond that currently planned, will face a net enrollment capacity deficit of approximately -5,963 regular session FTE (-13,189 headcount students) in FY 2011. If we again disaggregate the "net" estimate for FY 2001, we find that nine institutions – Blue Ridge, Germanna, New River, Northern Virginia, Piedmont Virginia, Southside Virginia, Thomas Nelson, Tidewater, and Virginia Western Community College - are estimated to have had a combined capacity deficit of -8,536 regular session FTE (approximately -18,880 headcount students) for that year.

Figure 3-2 provides a graphical representation of the estimated net enrollment capacity surplus/deficit in the public two-year institutions based on current classroom and class lab utilization rates and also assuming guideline utilization rates.

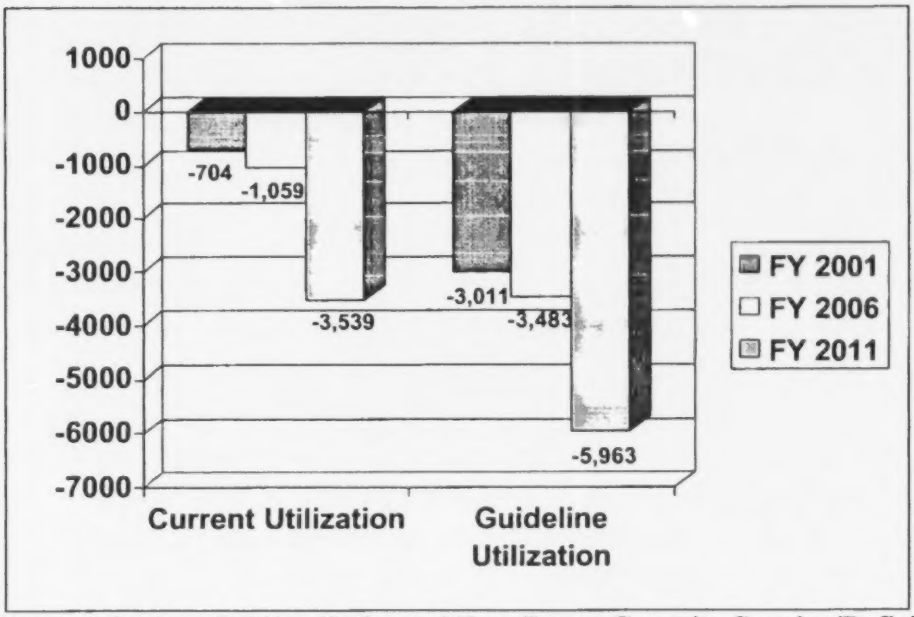

Figure 3-2: 2 yr. Publics, Estimated Enrollment Capacity Surplus/Deficit (regular session FTE)

Public Two-Year Institutions – Survey Analysis

In their survey responses, the community colleges typically did not identify an optimal enrollment size for their institutions. The primary reason for this has to do with the community colleges' open door admission policy and their mission to serve the needs of the local community. However, in their responses three institutions – Central Virginia, Paul D. Camp, and Tidewater Community Colleges – did indicate an intention to increase enrollment. Of these three, Tidewater Community College responded that it already faces a space deficit with respect to existing enrollment that would need to be addressed before the institution could accommodate additional enrollment growth. In addition, several institutions listed other constraints in meeting both existing enrollments as well as future enrollments. The most common of these were:

- insufficient number of faculty to meet instructional needs,
- over-reliance on part-time faculty to meet instructional needs,
- inadequate base funding,
- insufficient technical and occupational laboratory space,
- insufficient library space, and
- insufficient or deteriorating infrastructure.

Several of these concerns are corroborated by SCHEV's capital renovation, infrastructure and maintenance reserve recommendations as well as the Joint Subcommittee Studying Higher Education Funding Policies' recommended base adequacy model.

Private Non-Profit Institutions

Although SCHEV worked closely with, and received extensive cooperation from, the private non-profit institutions in an effort to develop quantitative enrollment capacity estimates for those institutions, due to irresolvable data issues we were unable to obtain satisfactory results from that process. As a result, for this category of institutions, we are forced to rely exclusively on survey analysis as a tool for assessing enrollment capacity.

Of the 24 private, non-profit institutions that responded to the survey most indicated the ability and desire to accept some additional enrollments. In total, these institutions have indicated that they could accept approximately 6,500 additional students currently and approximately 18,000 additional students by 2010. Like their public counterparts, the private institutions also report resource

constraints that could limit their ability to accept additional enrollment. Specifically, these institutions identified the following barriers:

- limited dormitory space,
- insufficient food services,
- limited student center space,
- limited operating resources, and
- limited library space.

Summary

- SCHEV used two methods to assess enrollment capacity – quantitative analysis and survey analysis.

- SCHEV based its quantitative analysis of enrollment capacity on a revised version of the *instructional and academic support space guideline* it has used since 1997 for prioritizing capital outlay requests from the public colleges and universities. The modified version of this guideline was used to better account for the broad diversity in academic missions that is characteristic of Virginia's higher education system.

- Based on SCHEV's quantitative analysis of enrollment capacity, and taking current classroom and class lab utilization rates as given, we estimate that the public four-year institutions: 1) could have accommodated approximately 575 additional regular session FTE (752 headcount students) in FY 2001, 2) will face a net enrollment capacity deficit of approximately -3,429 regular session FTE (-4,487 headcount students) in FY 2006, and 3) assuming no additional space beyond that currently planned, will face a net enrollment deficit of approximately -11,055 regular session FTE (-14,466 headcount students) in FY 2011.

- Disaggregating the "net" enrollment capacity estimate for FY 2001 to account for the likelihood that enrollment surpluses in one institution may not "cancel out" enrollment deficits in another, we find that five institutions (George Mason University, James Madison University, Old Dominion University, Radford University, and the Virginia Polytechnic Institute) are estimated to have had a combined capacity deficit of approximately -6,379 regular session FTE (-8,347 headcount students) that year.

- Again taking current classroom and class lab utilization rates as given, we estimate that the community colleges: 1) faced a net -704 regular session FTE (approximately -1,557 headcount students) enrollment capacity deficit in FY 2001, 2) will face a net -1,059 regular session FTE (approximately -2,342 headcount student) enrollment deficit in FY 2006, and 3) assuming no additional space beyond that currently planned, will face a net enrollment capacity deficit of approximately -3,539 regular session FTE (-7,827 headcount students) in FY 2011.

- Because there is virtually no overlap in the geographic areas from which individual community colleges draw their students, it is extremely unlikely that

enrollment capacity surpluses in one institution will "cancel out" enrollment capacity deficits in another. Disaggregating the "net" enrollment capacity estimate for FY 2001 to account for this fact shows that eight institutions – Blue Ridge, Germanna, Northern Virginia, Piedmont Virginia, Southside Virginia, Thomas Nelson, Tidewater, and Virginia Western Community College – are estimated to have had a combined capacity deficit of -7,161 regular session FTE (approximately -15,839 headcount students) for that year.

- Individual colleges and universities vary significantly in how intensively they use their existing classroom and class lab space, however, and this level of utilization has a significant effect on enrollment capacity.

- If we adjust the data to reflect the amount of space that would be required if all public four-year colleges and universities used their classroom and class lab space as intensely as SCHEV's utilization guidelines require, we derive a "best-case-scenario" enrollment capacity estimate which indicates that the four-year public institutions: 1) could have accommodated approximately 4,505 additional regular session FTE (5,895 headcount students) in FY 2001, 2) could accommodate approximately 617 additional regular session FTE (807 headcount students) in FY 2006, and 3) assuming no additional space beyond that currently planned, will face a net enrollment capacity deficit of approximately -7,009 regular session FTE (-9,172 headcount students) in FY 2011.

- Disaggregating this "net" enrollment capacity estimate for FY 2001 we find that five institutions – George Mason University, James Madison University, Old Dominion University, Radford University, and the Virginia Polytechnic Institute – are estimated to have had a combined capacity deficit of approximately -5,112 regular session FTE (-6,689 headcount students) for that year.

- Adjusting the data to reflect the amount of space that would be required if VCCS used its classroom and class lab space as intensely as SCHEV's utilization guidelines require, we derive a "best-case-scenario" enrollment capacity estimate which indicates that the community colleges: 1) experienced a net enrollment capacity deficit of approximately -3,011 regular session FTE (-6,660 headcount students) in FY 2001, 2) will face a net enrollment capacity deficit of approximately -3,483 regular session FTE (-7,704 headcount students) in FY 2006, and 3) assuming no additional space beyond that currently planned, will face a net enrollment capacity deficit of approximately -5,963 regular session FTE (-13,189 headcount students) in FY 2011.

- Disaggregating this "net" enrollment capacity estimate for FY 2001 we find that nine institutions – Blue Ridge, Germanna, New River, Northern Virginia, Piedmont Virginia, Southside Virginia, Thomas Nelson, Tidewater, and Virginia Western Community College – are estimated to have had a combined capacity deficit of -8,536 regular session FTE for that year.

Chapter 4 – Access

Introduction

In Chapter 2 we looked at the number of students who are likely to enter Virginia's system of higher education in the future based on existing enrollment patterns and projections of future demographic trends – in other words, the number of individuals who likely will attend Virginia colleges and universities. In this chapter, we look beyond existing enrollment patterns to assess whether there are geographic areas of the Commonwealth that are currently underserved by Virginia's system of higher education. Simply put, are there groups of individuals who would enroll in Virginia's system of higher education, but are prevented from doing so because of a lack of access?

To answer this question, we first look to see whether there are regional differences in college enrollment rates across Virginia. This analysis is presented in the following section entitled Enrollment Rates. Areas of the Commonwealth that have lower than average college enrollment rates may be currently underserved by higher education. We say "may" because lower than average college enrollment rates alone are not sufficient to identify populations that do not have adequate access to higher education. We need to know what is driving differences in college enrollment rates. For example, is it geographic access or, in the alternative, regional differences in workforce needs and/or community attitudes toward education? To shed some light on this issue, in the section entitled Factors Likely to Affect Enrollment , we take a look at several factors that may drive regional differences in the proportion of people who choose to attend college.

Enrollment Rates

Figures 4-1 through 4-4 provide a graphical representation of the college and university enrollment rates in Virginia for fall 2000, by county, for four age groups – 15 to 19 year olds, 20 to 24 year olds, 25 to 34 year olds, and 35 to 44 year olds. Recall from Chapter 2 that individuals within these age categories comprise nearly the entire student enrollment of Virginia's public four-year (95 percent), private non-profit (94 percent), public two-year (89 percent), and private for-profit (98 percent) colleges and universities. The county-level enrollment rates depicted in Figures 4-1 through 4-4 are for all institutions combined, which is to say they include everyone who was enrolled in any Virginia institution of higher education in fall 2000.

As shown in Figure 4-1, when we look at all institutions in the aggregate, county-level college attendance rates for 15 to 19 year olds in fall 2000 tended to be highest in Southwest Virginia, the Southern Piedmont, Northern Virginia, Central Virginia, and Hampton Roads. As shown in Figure 4-2, aggregate college enrollment rates for 20 to 24 year olds tended to be higher in the Roanoke area, Northern Virginia, Central Virginia, and Hampton Roads. Finally, college attendance rates for "non-traditional" students, those between 25 to 34 and 35 to 44 years of age, tended to be higher in the urban centers and some localities in Southwest Virginia and the Southern Piedmont, but nearly uniform throughout the remainder of the state. These enrollment rates are graphically depicted in Figures 4-3 and 4-4. As we will show, however, these aggregate, county-level college attendance rates mask important differences in enrollment rates by sector – public four-year, private non-profit, public two-year, and private for-profit.

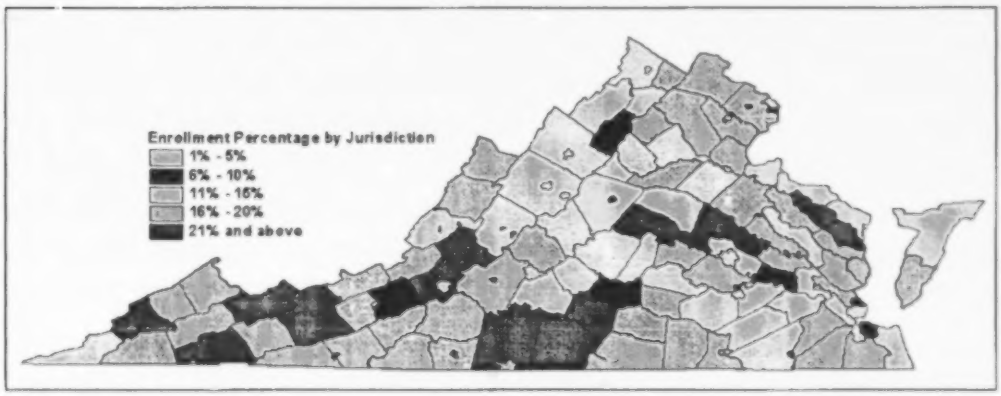

Figure 4-1: All Institutions – Fall 2000, 15 to 19 yr. old Enrollment Rate

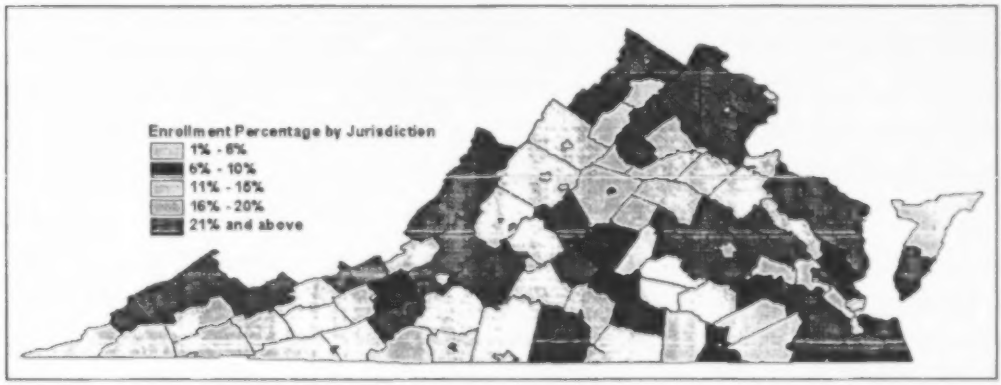

Figure 4-2: All Institutions – Fall 2000, 20 to 24 yr. old Enrollment Rate

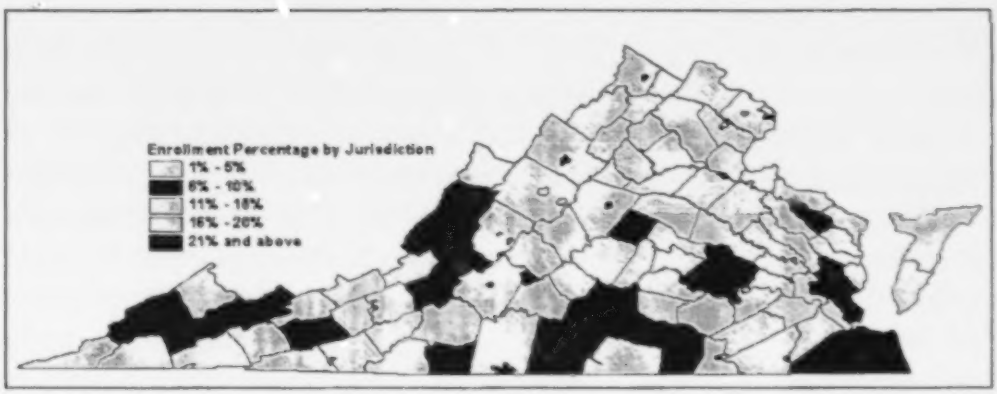

Figure 4-3: All Institutions – Fall 2000, 25 to 34 yr. old Enrollment Rate

Figure 4-4: All Institutions – Fall 2000, 35 to 44 yr. old Enrollment Rate

Four-Year Institutions

Public Four-Year Colleges and Universities

Figures 4-5 through 4-8 provide a graphical representation of fall 2000 county-level enrollment rates in Virginia's public four-year colleges and universities. As these figures show, across all age categories enrollment rates in the public four-year institutions tended to be higher in those localities in the Roanoke area and the eastern portion of the Commonwealth – Northern Virginia, Central Virginia, and Hampton Roads. This finding is consistent with information presented in Chapter 2, which showed that these institutions tend to draw a disproportionate number of their students from the I-95/I-64 crescent in the eastern portion of the state. However, Figures 4-5 through 4-8 indicate that this

enrollment pattern is driven, not only by the fact that the I-95/I-64 crescent is more populous than other areas of the state, but also because, a larger proportion of individuals from the I-95/I-64 crescent either choose to, or are able to, attend public four-year colleges and universities than in other areas of the state.

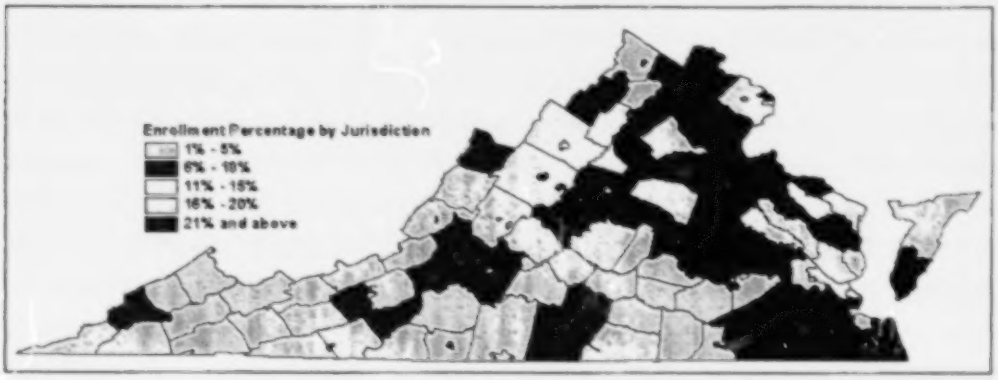

Figure 4-5: 4 yr. Publics – Fall 2000, 15 to 19 yr. old Enrollment Rate

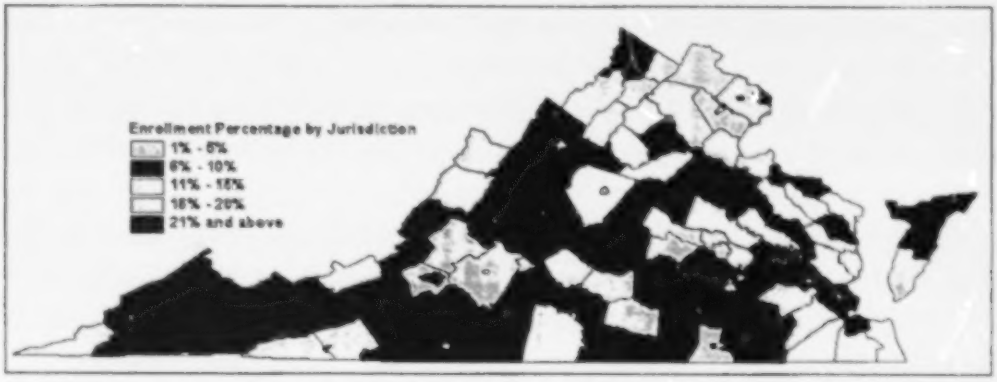

Figure 4-6: 4 yr. Publics – Fall 2000, 20 to 24 yr. old Enrollment Rate

Figure 4-7: 4 yr. Publics – Fall 2000, 25 to 34 yr. old Enrollment Rate

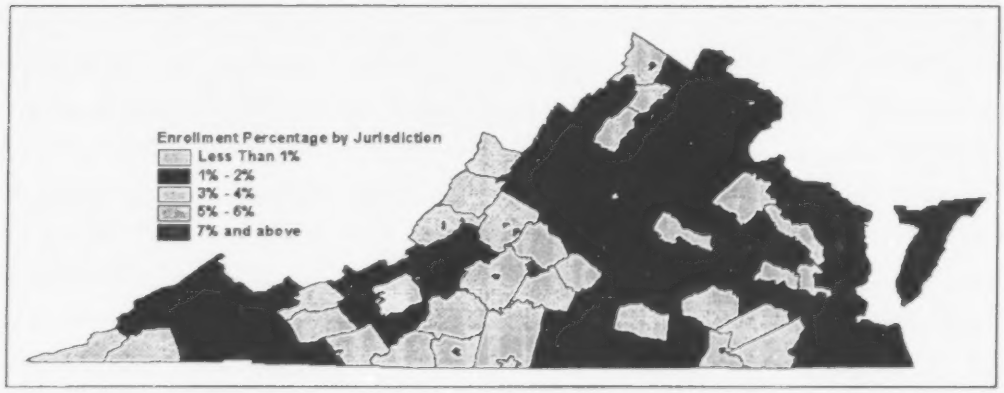

Figure 4-8: 4 yr. Publics – Fall 2000, 35 to 44 yr. old Enrollment Rate

Private Non-Profit Colleges and Universities

Figures 4-9 through 4-12 provide a graphical representation of county-level enrollment rates in Virginia's private non-profit colleges and universities in fall 2000. In contrast to the public four-year institutions, across all age groups enrollment rates in the private non-profit institutions tended to be higher in localities within the Valley, the Southern Piedmont, and, to a lesser extent, the Richmond area. This finding is also consistent with information presented in Chapter 2. Here again, however, the importance of Figures 4-9 through 4-12 is that they demonstrate that these enrollment patterns are driven by the fact that a larger proportion of individuals in the Valley and the Southern Piedmont either choose to, or are able to, attend private non-profit institutions relative to other areas of the state.

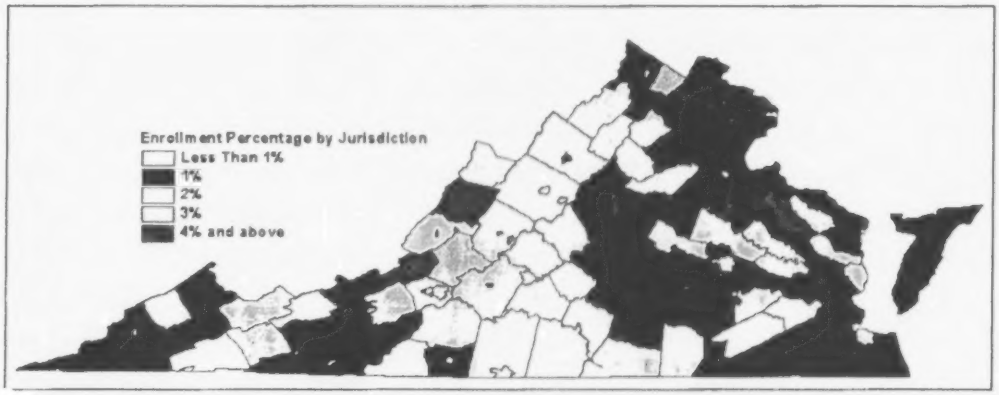

Figure 4-9: Private Non-Profits – Fall 2000, 15 to 19 yr. old Enrollment Rate

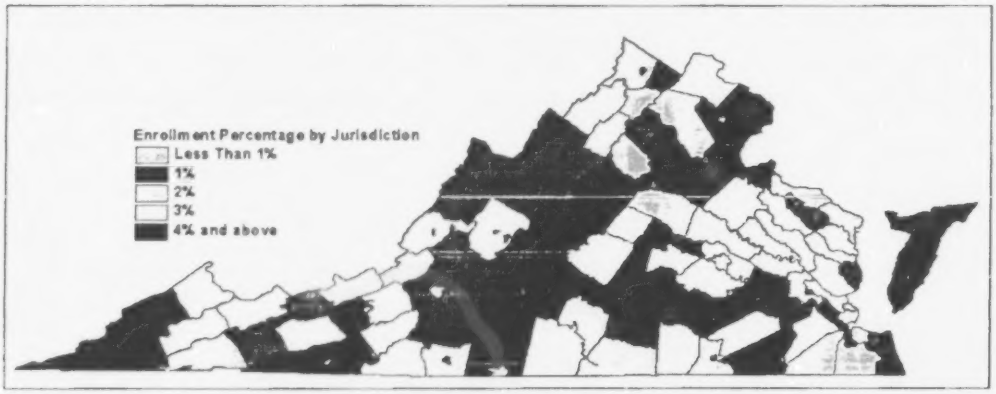

Figure 4-10: Private Non-Profits – Fall 2000, 20 to 24 yr. old Enrollment Rate

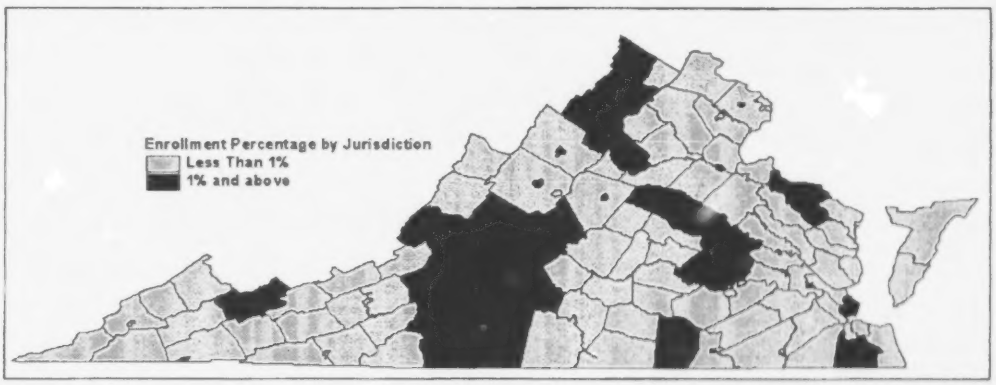

Figure 4-11: Private Non-Profits – Fall 2000, 25 to 34 yr. old Enrollment Rate

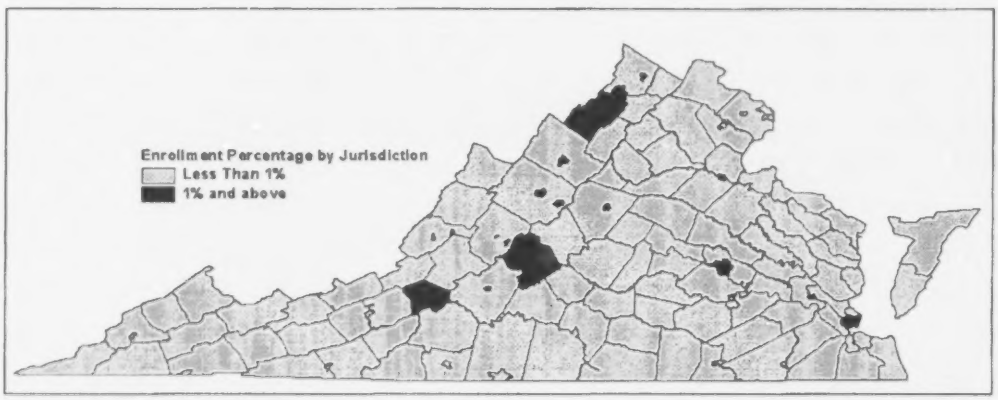

Figure 4-12: Private Non-Profits – Fall 2000, 35 to 44 yr. old Enrollment Rate

All Four-Year Institutions

Figures 4-13 through 4-16 combine the data on public four-year and private non-profit colleges and universities provide an overall view of attendance rates for four-year institutions, public or private. What these figures show is that in fall 2000 enrollment rates for "traditional" aged students, those 24 years of age or younger, tended to be higher in the Roanoke area, Northern Virginia, Central Virginia, and Hampton Roads. In contrast, enrollment rates for traditional aged students tended to be lowest in Southwest Virginia and the Southern Piedmont. Enrollment rates for non-traditional aged students, those between 25 and 44 years of age, tended to be highest in the Roanoke area, Central Virginia, and Hampton Roads.

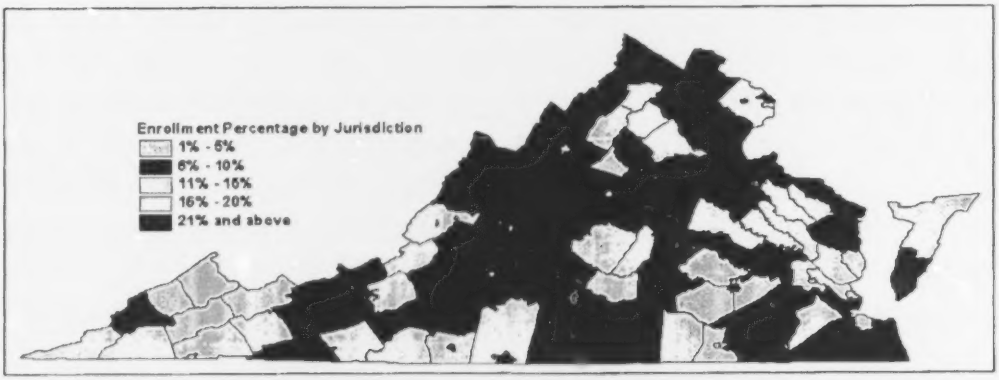

Figure 4-13: All 4 Yr. Insts. – Fall 2000, 15 to 19 yr. old Enrollment Rate

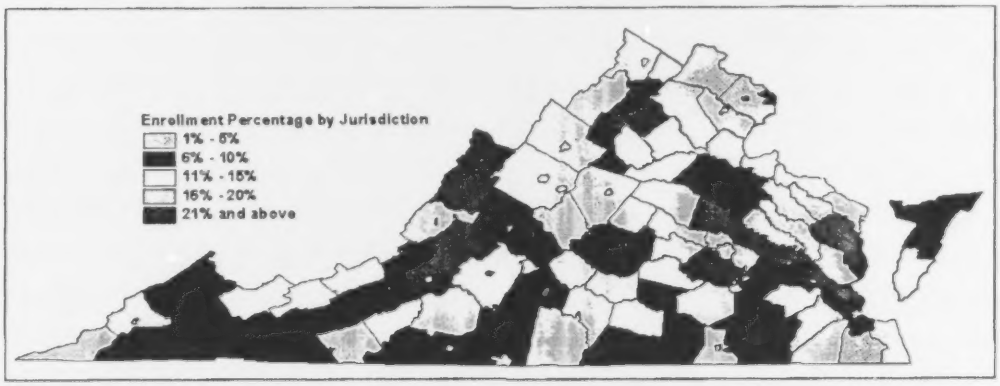

Figure 4-14: All 4 Yr. Insts. – Fall 2000, 20 to 24 yr. old Enrollment Rate

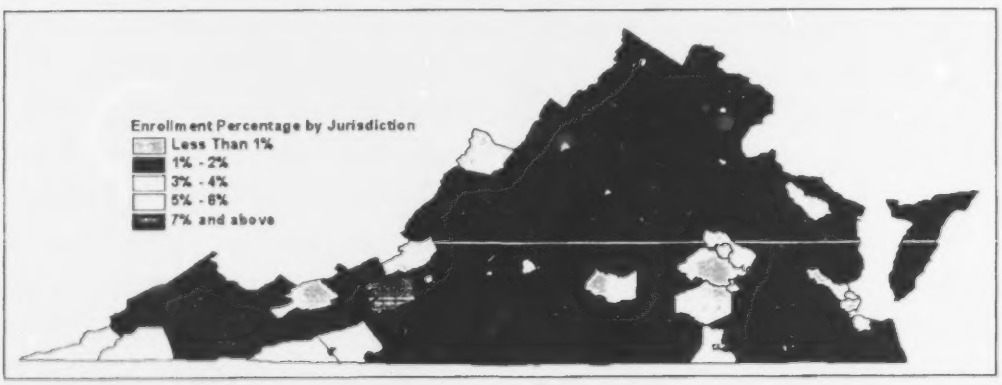

Figure 4-15: All 4 Yr. Insts. – Fall 2000, 25 to 34 yr. old Enrollment Rate

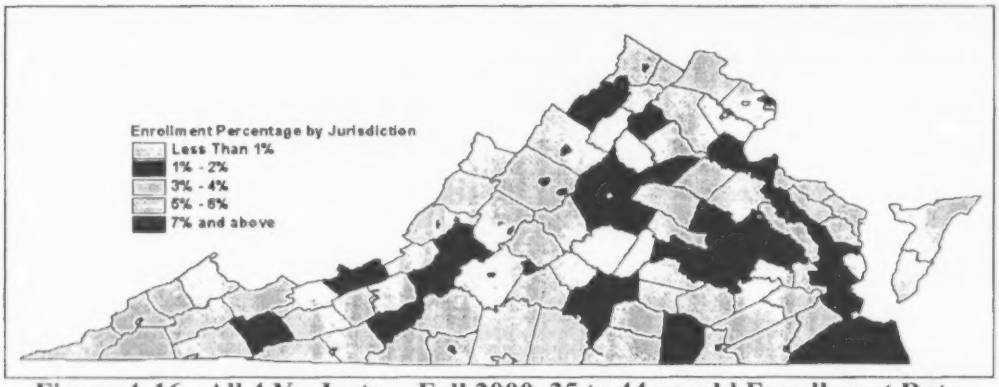

Figure 4-16: All 4 Yr. Insts. – Fall 2000, 35 to 44 yr. old Enrollment Rate

Public Two-Year Institutions

Fall 2000 county-level enrollment rates in Virginia's public two-year colleges (the Virginia Community College System and Richard Bland College) are displayed in Figures 4-17 through 4-20. As can be clearly seen in Figure 4-17, enrollment rates for 15 to 19 year olds in these institutions tended to be greater in localities within Southwest Virginia, and the southern portions of the Valley and the Southern Piedmont. Similarly, enrollment rates for 25 to 34 year olds tended to be greater in localities within Southwest Virginia, the southern portions of the Valley, the Southern Piedmont, Northern Neck, Hampton Roads, and urban areas generally (*see* Figure 4-19). Enrollment rates for 20 to 24 year olds and 35 to 44 year olds, however, did not appear to exhibit region-specific differences (*see* Figures 4-18 and 4-20).

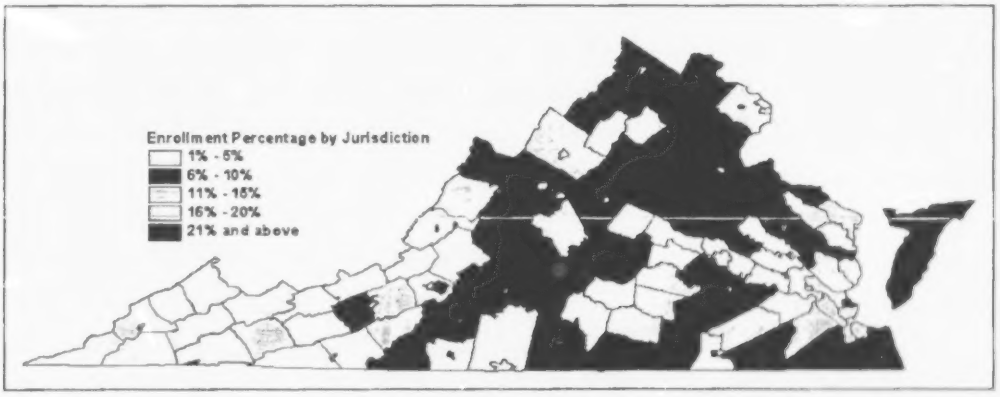

Figure 4-17: 2 yr. Publics – Fall 2000, 15 to 19 yr. old Enrollment Rate

Figure 4-18: 2 yr. Publics – Fall 2000, 20 to 24 yr. old Enrollment Rate

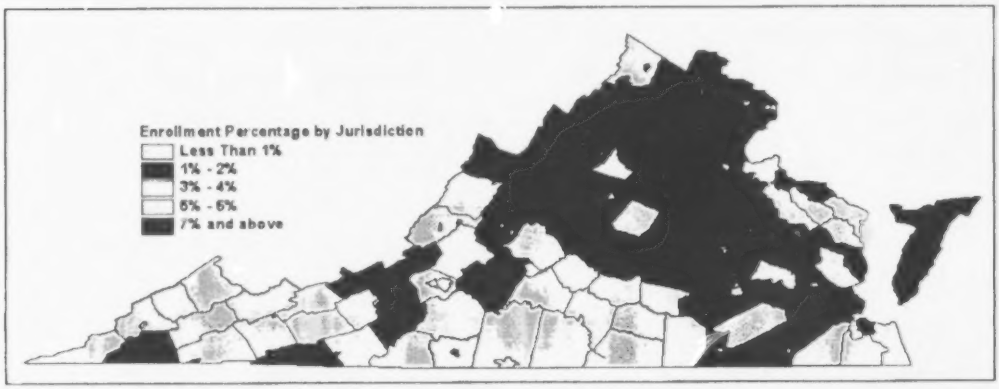

Figure 4-19: 2 yr. Publics – Fall 2000, 25 to 34 yr. old Enrollment Rate

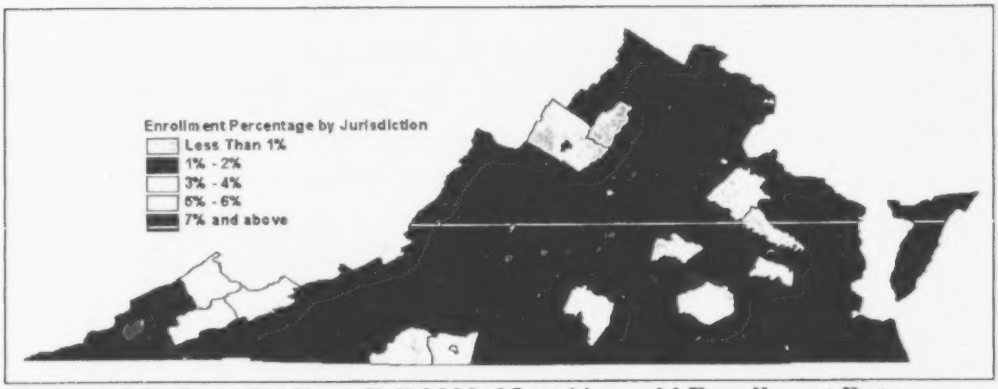

Figure 4-20: 2 yr. Publics – Fall 2000, 35 to 44 yr. old Enrollment Rate

Private For-Profit Institutions

In Figures 4-21 through 4-24, we present comparable information for Virginia's private for-profit institutions. As these figures show, enrollment rates for 20 to 24 year olds in these institutions are highest in localities within the Roanoke area, Central Virginia, and Hampton Roads. Enrollment rates for all other age groups, and all other regions, are negligible.

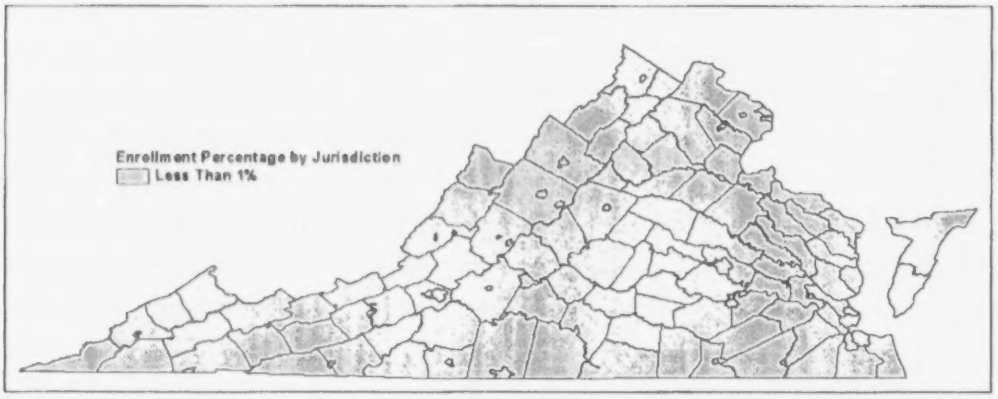

Figure 4-21: Private For-Profits – Fall 2000, 15 to 19 yr. old Enrollment Rate

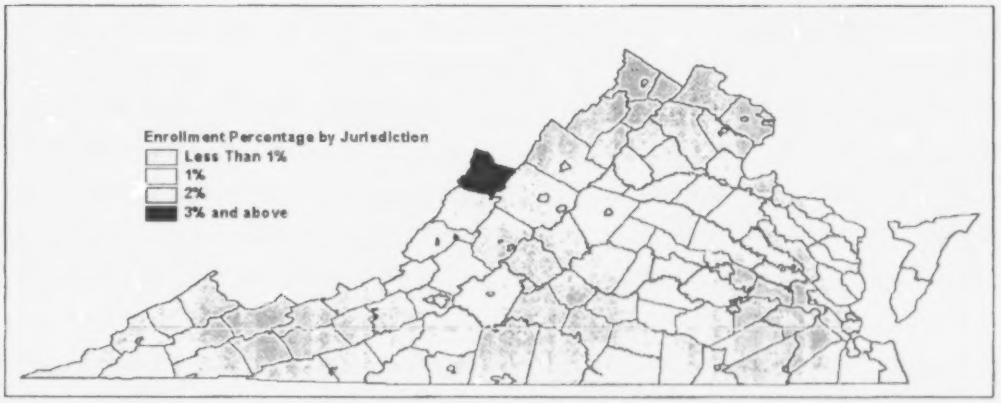

Figure 4-22: Private For-Profits – Fall 2000, 20 to 24 yr. old Enrollment Rate

Figure 4-23: Private For-Profits – Fall 2000, 25 to 34 yr. old Enrollment Rate

Figure 4-24: Private For-Profits – Fall 2000, 35 to 44 yr. old Enrollment Rate

Summary – Enrollment Rates

- College attendance rates for 15 to 19 year olds tend to be higher in Southwest Virginia, the Southern Piedmont, Northern Virginia, Central Virginia, and Hampton Roads. Attendance rates for 20 to 24 year olds tended to be highest in the Roanoke area, Northern Virginia, Central Virginia, and Hampton Roads. Attendance rates for "non-traditional" students (25 years of age and above) tended to be highest in the urban areas. These aggregate college attendance rates tend to mask important regional differences in which type of college students attend however.

- Residents of the I-95/I-64 crescent, comprised of Central Virginia, Northern Virginia, and Hampton Roads, enroll more heavily in public four-year colleges and universities than do individuals from other regions of the Commonwealth.

- Residents of the Valley and the Southern Piedmont enroll more heavily in private non-profit colleges and universities than do individuals from other regions of the Commonwealth.

- Residents of Southwest Virginia, and portions of the Valley and the Southern Piedmont enroll more heavily in public two-year colleges (almost exclusively in the Virginia Community College System) than do individuals from other regions of the Commonwealth.

- Enrollment rates in four-year colleges and universities tend to be highest in the Roanoke area, Northern Virginia, Central Virginia, and Hampton Roads. Conversely, they tend to be lowest in Southwest Virginia and the Southern Piedmont.

In the next few sections we look at some factors that may explain these regional differences in enrollment rates.

Factors Likely to Affect Enrollment

In this section we look at three factors that are likely to affect an individual's decision to enroll in college – geographic access, economic opportunity, and income/financial aid. The purpose of this analysis is to shed light on the underlying cause(s) for the regional differences in enrollment rates discussed in the prior section. Through this analysis we hope to identify the extent to which regional differences in enrollment rates are truly indicative of "underserved" populations. It is important to keep in mind, however, that the list of variables evaluated is constrained by data availability and therefore does not include difficult to measure factors, such as regional culture, that may, nonetheless, have an impact on enrollment rates.

Drive Time Analysis

To ascertain whether geographic access – the proximity of people to institutions of higher education – has an effect on enrollment rates, SCHEV used Geographic Information System (GIS) software to conduct a drive time analysis. This analysis identifies localities that are within a specific drive time (*e.g.*, one-hour, 30-minutes) of each Virginia institution of higher education, taking into

account Virginia's transportation grid and the average speed on each interstate, primary, and secondary highway. Because of data availability, this analysis is restricted to each institution's main campus and does not take off-campus sites into account.[49]

Public Four-Year Colleges and Universities

Figures 4-25 and 4-26 display the results of this analysis for Virginia's public four-year colleges and universities. As shown in Figure 4-25, the majority of localities in Virginia are within a one-hour drive time of a public four-year college or university. Of the 135 Virginia localities included in the analysis, only twenty are more than a one-hour drive from the main campus of a public four-year institution.[50] These twenty localities are located in Southwest Virginia, the Southern Piedmont, the northernmost portion of the Valley, Northern Neck, and the Eastern Shore. However, as shown in Figure 4-26, if we restrict the analysis to a 30-minute drive time, the majority of counties that fall within this range of a public four-year institution are located within the I-95/I-64 crescent in the eastern portion of the Commonwealth, with a smaller number scattered across the Southwest, Valley, and Southern Piedmont.

Does geographic access have an effect on enrollment rates? One way to answer this question is to test to see whether there is a statistically significant correlation between the two. Such a correlation is an indication that the two events tend to be related. It is important to keep in mind, however, that demonstrating statistical correlation is not the same thing as demonstrating causality. Moreover, because simple statistical correlations only test the relationship between pairs of events (*e.g.*, geographic access and college attendance rates), they do not provide any insight into the relative importance of different causal variables (*e.g.*, the relative importance of geographic proximity, economic opportunity, or family income on college attendance rates).

When we conduct that analysis, we find there is a strong positive statistical correlation between whether a locality is within a 30-minute drive of a public four-year institution and the proportion of individuals in that locality that are enrolled in public four-year institutions, although no similar correlation exists with respect

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[49] In fall 2000, off-campus enrollments accounted for 9.7 percent of total headcount enrollment in Virginia's public four-year colleges and universities, 12.7 percent in the public two-year colleges, 10.8 percent in the private non-profit colleges and universities, and 19.5 percent in the private for-profit institutions.

[50] For purposes of this analysis, a locality is defined as being within the drive time range if a majority of the locality falls within that range.

to a one-hour drive time.[51] This means that college attendance rates at public four-year institutions tend to be higher in those localities that are within a 30-minute drive of a public four-year institution than in those that are not. Whereas this relationship is statistically significant across all age categori , it appears strongest for "non-traditional" students, those 25 years of age and old .

Although correlation can tell us whether there is a relationship between two events, it does not tell us whether the outcome of that relationship is itself significant. Put another way, even if college attendance rates at public four-year institutions tend to be higher in those localities that are within a 30-minute drive of such an institution, is the difference significant? One way to answer this question is to compare enrollment rates in those counties that are within a 30-minute drive of a public four-year institution with enrollment rates in those that are not. If the difference between the two is larger than could be explained by random chance, it provides further evidence that geographic access has an effect on college attendance.

Table 4-1 lists, by age category, the median attendance rate in public four-year colleges for each of group of counties. As the table shows, although median attendance rates for all age categories tend to be higher in those counties that are within a 30-minute drive of a public four-year institution than in those that are not, the differences are only statistically significant for 25 to 34 year olds and 35 to 44 year olds – "non-traditional" students. This finding is not unanticipated. Because non-traditional students are older, they tend to work, have families, attend part-time or in the eve ning, and are generally more "place-bound" than younger, "traditional-aged" students.

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[51] The Pearson Rank Order Correlation Coefficient between whether a locality is within a 30-minute drive time of a public four-year institution and the proportion of individuals in that locality that attend public four-year institutions is 0.2312 for 15 to 19 year olds (statistically significant at the 98 percent confidence level), 0.1680 for 20 to 24 year olds (statistically significant at the 90 percent confidence level), 0.2998 for 25 to 34 year olds (statistically significant at the 99 percent confidence level), and 0.3319 for 35 to 44 year olds (statistically significant at the 99.9 percent confidence level). The Pearson Rank Order Correlation Coefficient between whether a locality is within a one-hour drive time of a public four-year institution and the proportion of individuals in that locality that attend public four-year institutions is 0.1174 for 15 to 19 year olds (not statistically significant at the 90 percent confidence level), 0.1094 for 20 to 24 year olds (not statistically significant at the 90 percent confidence level), 0.1226 for 25 to 34 year olds (not statistically significant at the 90 percent confidence level), and 0.1476 for 35 to 44 year olds (not statistically significant at the 90 percent confidence level).

Table 4-1: 4 Yr. Publics – Enrollment Rates by Drive Time

	15 to 19 yr. olds	20 to 24 yr. olds	25 to 34 yr. olds	35 to 44 yr. olds
Enrollment Rates of Localities Within 30-Minute Drive Time	6.6%	10.0%	2.0%	0.9%
Enrollment Rates of Localities Not Within 30-Minute Drive Time	5.2%	9.0%	1.2%	0.5%
Difference Statistically Significant at 95% Confidence Level	No	No	YES	YES

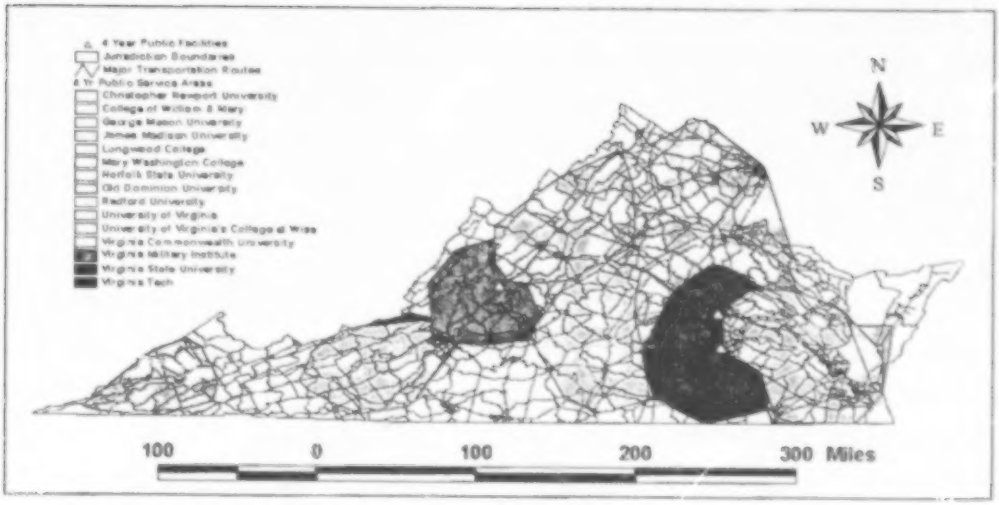

Figure 4-25: 4 Yr. Publics – Localities Within a One-hour Drive Time

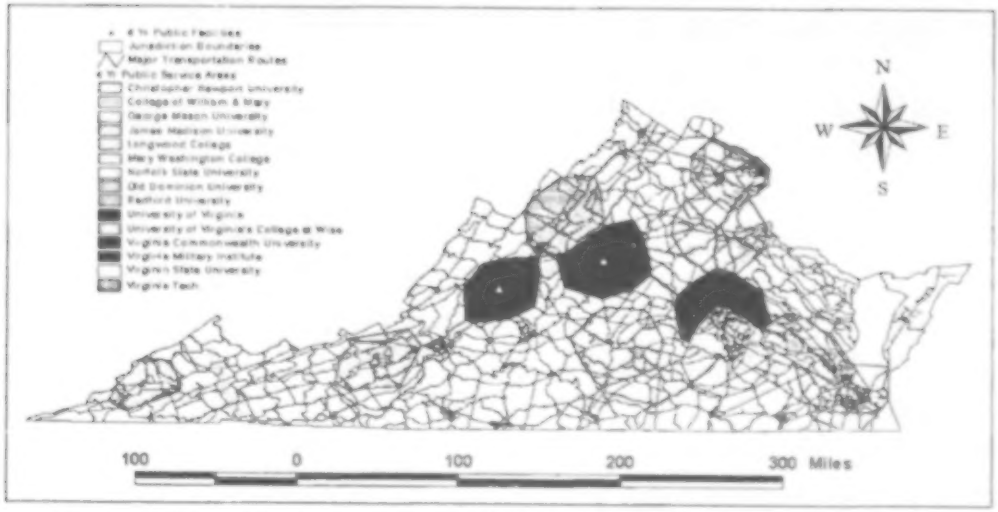

Figure 4-26: 4 Yr. Publics – Localities Within a 30-Minute Drive Time

Private Non-Profit Colleges and Universities

Figures 4-27 and 4-28 provide information on the drive time analysis for Virginia's private non-profit colleges and universities. As shown in Figure 4-27 almost all Virginia localities are within a one-hour drive of a private non-profit institution. Of the 135 localities included in the analysis, only eight fall outside this range. When we restrict the drive time to 30 minutes, however, a different picture emerges. As can be seen from Figure 4-28, the localities that are within 30 minutes of a private non-profit institution tend to be concentrated in the Bristol area, the Valley, the Southern Piedmont, Northern Virginia, the Richmond area, and Hampton Roads. As demonstrated in the previous section on enrollment rates, these are also the areas that tend to have relatively high enrollment rates in private non-profit institutions.

If we statistically test the relationship between geographic proximity and enrollment rates in private non-profit institutions, we find that there is a significant positive correlation between whether a locality is within a 30-minute drive of a private non-profit institution and the proportion of 25 to 34, and 35 to 44 year olds in that locality that attend private non-profit institutions. In other words, attendance rates at private non-profits institutions for "non-traditional" students tend to be higher in those localities that are within a 30-minute drive of a private non-profit institution. As with the public institutions, however, no such correlation exists with respect to a one-hour drive time.[52]

Table 4-2 takes this analysis a step further by comparing the median attendance rate in private non-profit institutions for those counties that are within a 30-minute of drive of such an institution and those that are not. As with the public four-year institutions, although median attendance rates for all age categories tend to be higher in those counties that are within a 30-minute drive than in those that are not, the differences are only statistically significant for "non-traditional" students – those 25 years of age or older.

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[52] The Pearson Rank Order Correlation Coefficient between whether a locality is within a 30-minute drive time of a private non-profit institution and the proportion of individuals in that locality that attend private non-profit institutions is 0.1364 for 15 to 19 year olds (not statistically significant at the 90 percent confidence level), 0.1458 for 20 to 24 year olds (not statistically significant at the 90 percent confidence level), 0.2304 for 25 to 34 year olds (statistically significant at the 98 percent confidence level), and 0.2796 for 35 to 44 year olds (statistically significant at the 99 percent confidence level). The Pearson Rank Order Correlation Coefficient between whether a locality is within a one-hour drive time of a private non-profit institution and the proportion of individuals in that locality that attend private non-profit institutions is 0.0977 for 15 to 19 year olds (not statistically significant at the 90 percent confidence level), 0.0138 for 20 to 24 year olds (not statistically significant at the 90 percent confidence level), 0.0448 for 25 to 34 year olds (not statistically significant at the 90 percent confidence level), and 0.1401 for 35 to 44 year olds (not statistically significant at the 90 percent confidence level).

Table 4-2: Private Non-Profits – Enrollment Rates by Drive Time

	15 to 19 yr. olds	20 to 24 yr. olds	25 to 34 yr. olds	35 to 44 yr. olds
Enrollment Rates of Localities Within 30-Minute Drive Time	1.6%	2.3%	0.4%	0.3%
Enrollment Rates of Localities No Within 30-Minute Drive Time	1.3%	1.7%	0.2%	0.1%
Difference Statistically Significant at 95% Confidence Level	No	No	YES	YES

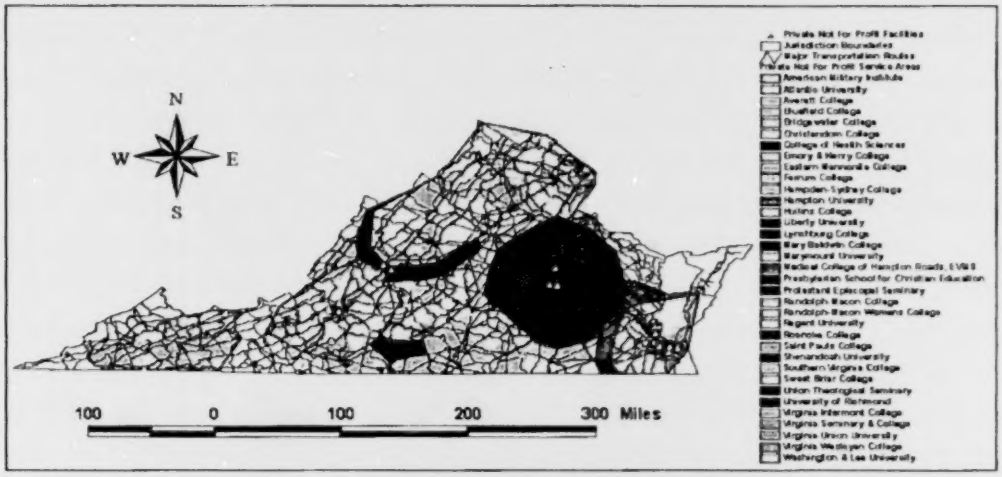

Figure 4-27: Private Non-Profits – Localities Within a One-hour Drive Time

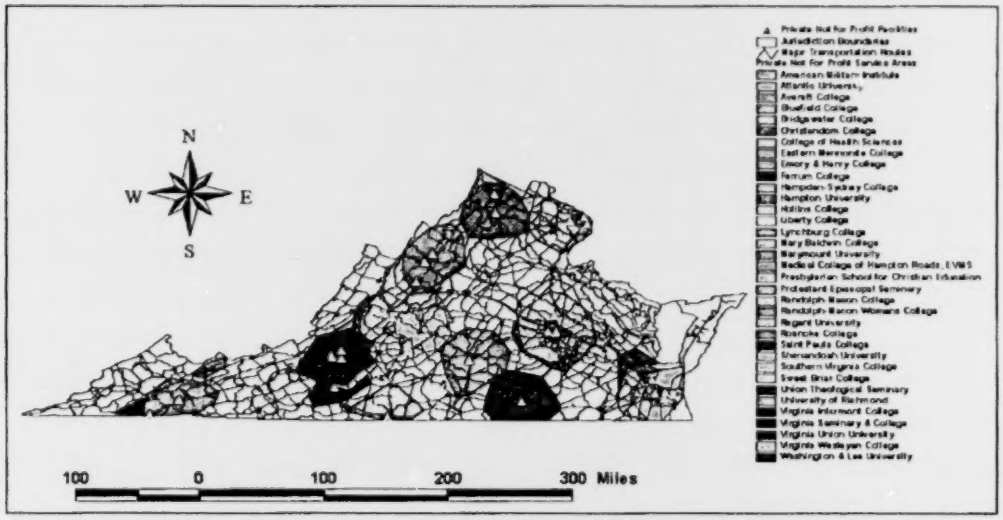

Figure 4-28: Private Non-Profits – Localities Within a 30-Minute Drive Time

All Four-Year Institutions

In the previous two sections, we showed that, in both public four-year and private non-profit institutions, attendance of "non-traditional" students 25 years of age or older tends to be higher in those localities that are within a 30-minute drive of such institutions. A relevant question then becomes – *which Virginia localities are within a 30-minute drive from a public four-year institution, a private four-year institution, or both, and which are not?* As graphically depicted in Figure 4-

29, 47 Virginia localities are within a 30-minute drive of both a public and a private four-year institution, 16 are within a 30-minute drive of at least one public four-year institution, 38 are within a 30-minute drive of at least one private four-year institution, and 34 are not within a 30-minute drive of either a public or private four-year institution. The 34 localities that are not within a 30-minute drive of either a public or private four-year institution tend to be located in the Southwest, the western portion of the Valley, the South Boston and Culpeper areas, the Northern Neck, and Eastern Shore. A detailed listing of these localities is provided in Appendix 4-A.

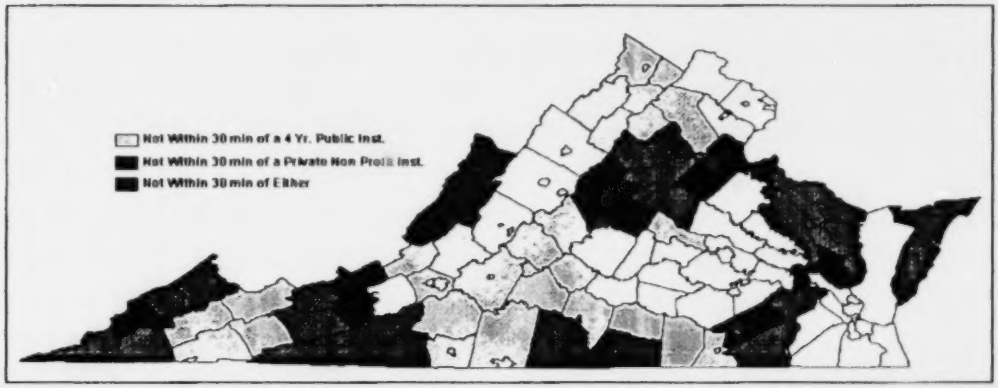

Figure 4-29: Localities Not Within a 30-Minute Drive of a 4 Yr. Institution

Public Two-Year Institutions

Figures 4-30 and 4-31 provide a graphical representation of the one-hour and 30-minute drive time analyses for Virginia's public two-year institutions. As shown in Figure 4-30, no locality in Virginia is more than a one-hour drive from a public two-year college. Moreover, out of the 135 Virginia localities included in the analysis, only 14 are more than a 30-minute drive from a public two-year college (*see* Figure 4-31). Given this level of geographic coverage, it is not surprising that our analysis shows no statistically significant relationship between drive times and enrollment rates in the public two-year institutions.[53]

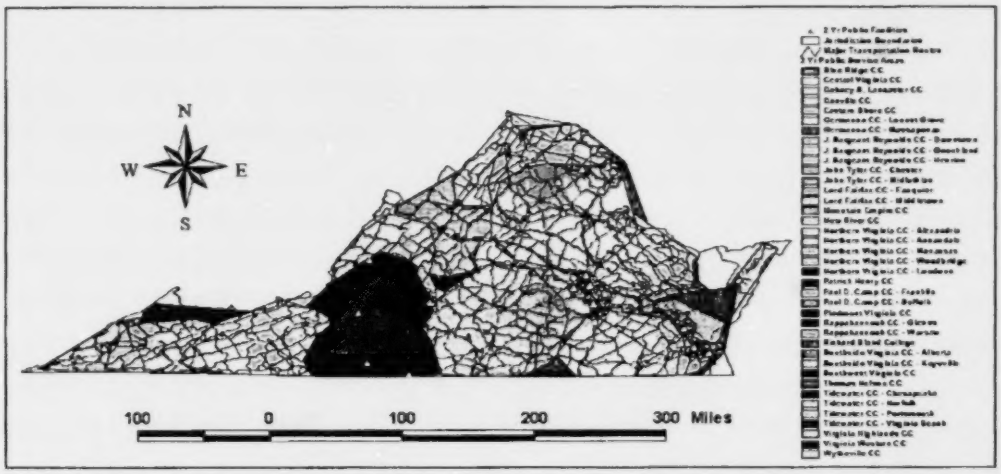

Figure 4-30: 2 Yr. Publics – Localities Within a One-hour Drive Time

[53] The Pearson Rank Order Correlation Coefficient between whether a locality is within a 30-minute drive time of a public two-year institution and the proportion of individuals in that locality that attend public two-year institutions is –0.0892 for 15 to 19 year olds (not statistically significant at the 90 percent confidence level), 0.0289 for 20 to 24 year olds (not statistically significant at the 90 percent confidence level), 0.0685 for 25 to 34 year olds (not statistically significant at the 90 percent confidence level), and 0.0729 for 35 to 44 year olds (not statistically significant at the 90 percent confidence level). Because all Virginia localities are within one hour of a public two-year institution, correlation coefficients for the one-hour drive time could not be computed.

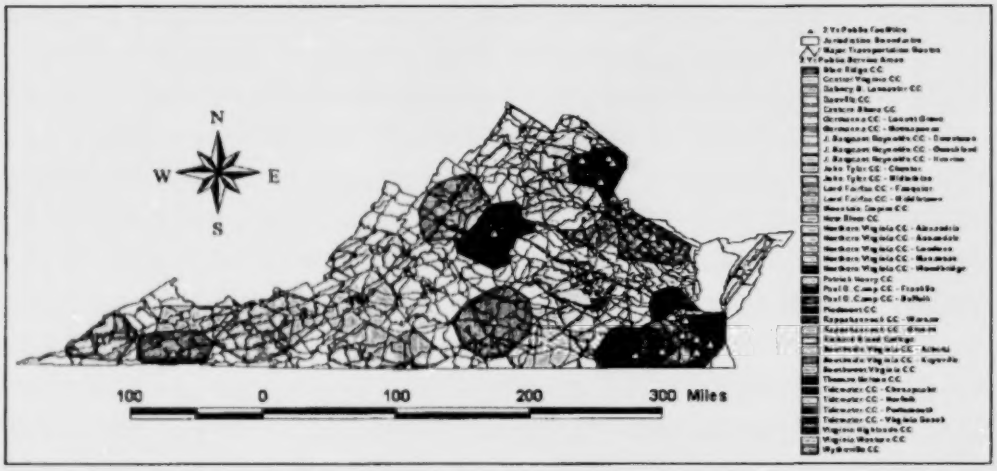

Figure 4-31: 2 Yr. Publics – Localities Within a 30-Minute Drive Time

Private For-Profit Institutions

Figures 4-32 and 4-33 provide a graphical representation of the drive time analysis for Virginia's private for-profit institutions. As can be seen from Figure 4-32, there are only a small number of Virginia localities (25 out of 135) that are not within a one-hour drive of a private for-profit institution. Restricting the analysis to a 30-minute drive time, as shown in Figure 4-33, reveals that localities within this range of a private for-profit institution tend to be clustered around the urban centers. This is not unexpected given that these institutions typically are professional schools that serve a specialized group of students. Our statistical analysis of the relationship between geographic proximity and enrollment rates for these institutions indicates that there is a significant positive correlation between the two for the age groups that these institutions typically enroll – 15 to 19 year olds and 20 to 24 year olds.[54]

[54] The Pearson Rank Order Correlation Coefficient between whether a locality is within a 30-minute drive time of a private for-profit institution and the proportion of individuals in that locality that attend private for-profit institutions is 0.1856 for 15 to 19 year olds (statistically significant at the 90 percent confidence level), 0.1240 for 20 to 24 year olds (not statistically significant at the 90 percent confidence level), -0.0732 for 25 to 34 year olds (not statistically significant at the 90 percent confidence level), and 0.1335 for 35 to 44 year olds (not statistically significant at the 90 percent confidence level). The Pearson Rank Order Correlation Coefficient between whether a locality is within a one-hour drive time of a private for-profit institution and the proportion of individuals in that locality that attend private for-profit institutions is 0.0803 for 15 to 19 year olds (not statistically significant at the 90 percent confidence level), 0.2090 for 20 to 24 year olds (statistically significant at the 95 percent confidence level), 0.0851 for 25 to 34 year olds (not statistically significant at the 90 percent confidence level), and 0.0592 for 35 to 44 year olds (not statistically significant at the 90 percent confidence level).

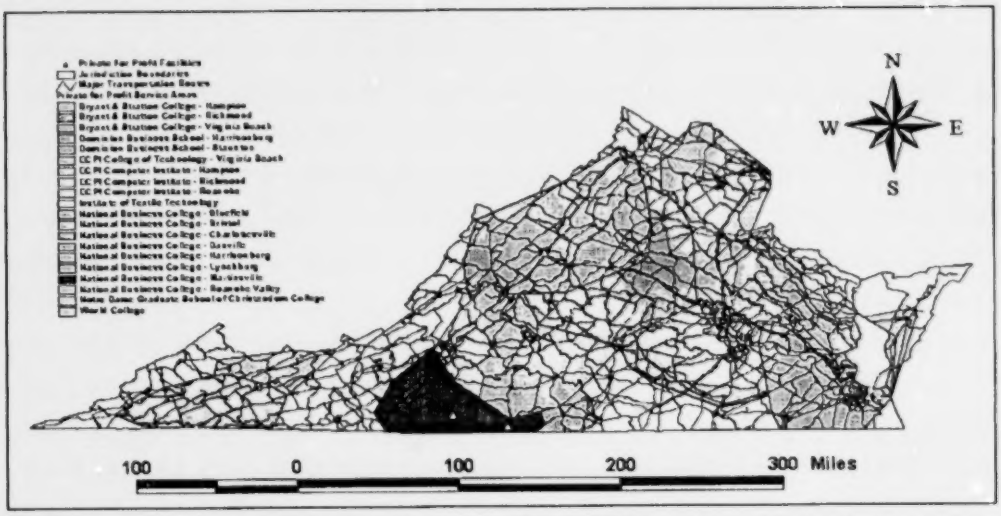

Figure 4-32: Private For-Profits – Localities Within a One-Hour Drive Time

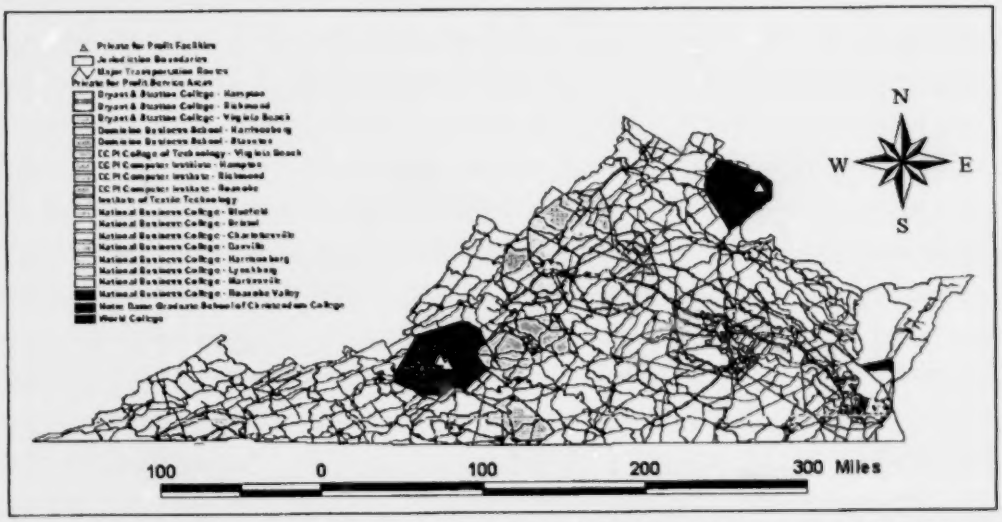

Figure 4-33: Private For-Profits – Localities Within a 30-Minute Drive Time

Summary – Drive Time Analysis

- County-level college attendance rates for "non-traditional" students tend to be highest in those counties that are within a 30-minute drive of a public or private four-year college or university and lowest in those that are not.

- There are 34 localities within Virginia that are not within a 30-minute drive of either a public or private four-year college or university. They are located in the Southwest, the western portion of the Valley, the South Boston and Culpeper areas, the Northern Neck, and the Eastern Shore.

- No Virginia locality is more than a one-hour drive from a public two-year institution, and only 14 out of 135 are more than a 30-minute drive from a public two-year institution.

Economic Opportunity

Another factor that may affect enrollment rates are differences in regional employment opportunities. Individuals from localities where the mix of available jobs is such that a college degree is typically not a prerequisite for employment, and who choose to remain in those localities, may be less inclined to pursue college. Conversely, individuals from localities where the mix of available jobs is such that a college degree is a prerequisite for employment may be more inclined to pursue college.

In Figure 4-34 we look at the proportion of jobs in each Virginia locality that fell within the mining, agriculture, and manufacturing sectors. With some exceptions, particularly in manufacturing, a college degree is typically not a prerequisite for employment in these sectors. As can be seen from this figure, employment in these economic sectors tends to be proportionally higher in the Southwest, Valley and Southern Piedmont. If we statistically test to see if there is a correlation between the proportion of jobs in a locality within these sectors and college attendance rates, we find, as expected, that the correlation is generally negative – college attendance rates tend to be lower in localities that have proportionally more mining, agriculture, and manufacturing jobs. In most cases these correlations are not statistically significant however.[55]

[55] The Pearson Rank Order Correlation Coefficient between the proportion of jobs in a locality that are within the mining, agriculture, and manufacturing sectors and the proportion of individuals in that locality that attend public four-year institutions is -0.0302 for 15 to 19 year olds (not statistically significant at the 90 percent confidence level), -0.0523 for 20 to 24 year olds (not statistically significant at the 90 percent confidence level), 0.0008 for 25 to 34 year olds (not statistically significant at the 90 percent confidence

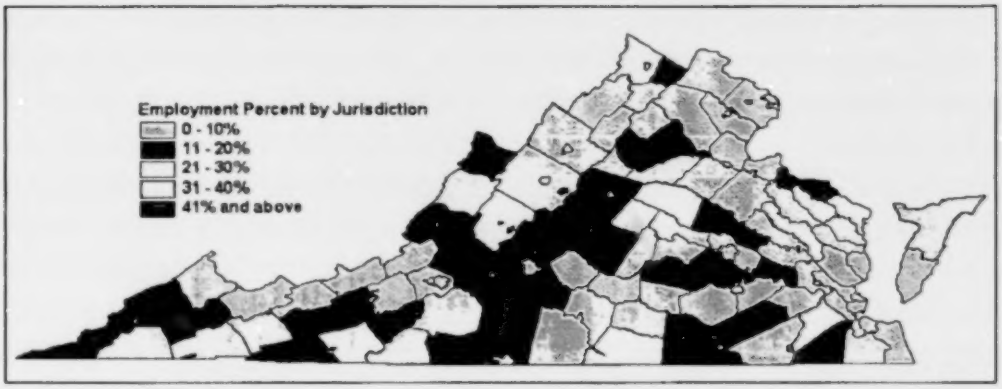

Figure 4-34: Employment in Mining, Agriculture, and Manufacturing.

In Figure 4-35 we look at the proportion of jobs in each Virginia locality that fell within the service, finance, insurance, real estate, and government sectors. With several exceptions, particularly in the service and government sectors, these jobs fall occupy the opposite side of the spectrum where a college degree is typically a prerequisite for employment. As Figure 4-35 shows, these jobs tend to be concentrated in the Southwest, the Roanoke area, Northern Virginia, Central Virginia, and Hampton Roads.

In this case, as expected, the analysis indicates a positive, although not statistically significant, correlation between employment in the service, finance, insurance, real estate, and government sectors and enrollment in the public four-year institutions. In other words, attendance rates at public four-year colleges and universities tend to be higher in localities that have proportionally more jobs in the service, finance, insurance, real estate, and government sectors.[56] Conversely, the

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level), and –0.0448 for 35 to 44 year olds (not statistically significant at the 90 percent confidence level). The comparable Pearson Rank Order Correlation Coefficients for attendance: 1) at private non-profit institutions are -0.0634 for 15 to 19 year olds (not statistically significant at the 90 percent confidence level), -0.0625 for 20 to 24 year olds (not statistically significant at the 90 percent confidence level), 0.2177 for 25 to 34 year olds (statistically significant at the 95 percent confidence level), and 0.2255 for 35 to 44 year olds (statistically significant at the 95 percent confidence level), 2) at public two-year institutions are -0.1778 for 15 to 19 year olds (statistically significant at the 90 percent confidence level), -0.0777 for 20 to 24 year olds (not statistically significant at the 90 percent confidence level), -0.0640 for 25 to 34 year olds (not statistically significant at the 90 percent confidence level), and –0.0625 for 35 to 44 year olds (not statistically significant at the 90 percent confidence level), and 3) at private for-profit institutions are 0.2987 for 15 to 19 year olds (statistically significant at the 99 percent confidence level), 0.0090 for 20 to 24 year olds (not statistically significant at the 90 percent confidence level), 0.0830 for 25 to 34 year olds (not statistically significant at the 90 percent confidence level), and –0.0245 for 35 to 44 year olds (not statistically significant at the 90 percent confidence level).

[56] The Pearson Rank Order Correlation Coefficient between the proportion of jobs in a locality that are within the service, finance, insurance, real estate, and government sectors and the proportion of individuals

statistical correlation with regard to enrollment in public two-year institutions is negative, indicating that the larger the proportion of service, finance, insurance, real estate, and government sector jobs in a locality, the smaller the proportion of individuals enrolled in a public two-year college or university.[57] In other categories of institutions, however, the results are more mixed.[58]

Figure 4-35: Employment in Service, Finance, Insurance, Real Estate, and Government.

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in that locality that attend public four-year institutions is 0.1143 for 15 to 19 year olds (not statistically significant at the 90 percent confidence level), 0.0387 for 20 to 24 year olds (not statistically significant at the 90 percent confidence level), 0.0732 for 25 to 34 year olds (not statistically significant at the 90 percent confidence level), and 0.0413 for 35 to 44 year olds (not statistically significant at the 90 percent confidence level).

[57] The Pearson Rank Order Correlation Coefficient between the proportion of jobs in a locality that are within the service, finance, insurance, real estate, and government sectors and the proportion of individuals in that locality that attend public two-year institutions is –0.2165 for 15 to 19 year olds (statistically significant at the 95 percent confidence level), -0.0334 for 20 to 24 year olds (not statistically significant at the 90 percent confidence level), -0.0475 for 25 to 34 year olds (not statistically significant at the 90 percent confidence level), and -0.0665 for 35 to 44 year olds (not statistically significant at the 90 percent confidence level).

[58] The comparable Pearson Rank Order Correlation Coefficients for attendance: 1) at private non-profit institutions are -0.1402 for 15 to 19 year olds (not statistically significant at the 90 percent confidence level), -0.1263 for 20 to 24 year olds (not statistically significant at the 90 percent confidence level), 0.0062 for 25 to 34 year olds (not statistically significant at the 90 percent confidence level), and 0.0530 for 35 to 44 year olds (not statistically significant at the 90 percent confidence level), and 2) at private for-profit institutions are 0.2248 for 15 to 19 year olds (statistically significant at the 95 percent confidence level), 0.0084 for 20 to 24 year olds (not statistically significant at the 90 percent confidence level), -0.0069 for 25 to 34 year olds (not statistically significant at the 90 percent confidence level), and 0.0367 for 35 to 44 year olds (not statistically significant at the 90 percent confidence level).

- Although largely inconclusive from a statistical perspective, the analysis of economic opportunity does provide some support for the conclusion that lower four-year college attendance rates in the Southwest and Southern Piedmont, and higher four-year college attendance rates in the eastern portion of the Commonwealth, are driven in part by differences in regional employment opportunities.

Income and Financial Aid

Individual financial resources can also affect enrollment rates. All else equal, individuals with greater financial means are better able to afford the direct cost of college in tuition and fees, and the indirect cost in forgone income, than individuals of lesser means. Figure 4-36 details median family income in Virginia by locality as taken from the 2000 U.S. Census. As this figure shows, median family income in Virginia in 2000 was highest in the Roanoke area, Northern Virginia, Central Virginia, and Hampton Roads.

If we statistically test the relationship between family income and enrollment rates, what we find is that there is a strong positive relationship between the median family income in a locality and the proportion of individuals in that locality that attend some public four-year college or university. Moreover, this relationship is statistically significant across all age categories.[59] The statistical results for all other categories of institutions were less conclusive, however, casting some doubt on whether the correlation between income and attendance at public four-year institutions is truly indicative of a causal relationship.[60]

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[59] The Pearson Rank Order Correlation Coefficient between the median family income in a locality and the proportion of individuals in that locality that attend public four-year institutions is 0.4886 for 15 to 19 year olds (statistically significant at the 99.9 percent confidence level), 0.4771 for 20 to 24 year olds (statistically significant at the 99.9 percent confidence level), 0.2365 for 25 to 34 year olds (statistically significant at the 98 percent confidence level), and 0.1725 for 35 to 44 year olds (statistically significant at the 90 percent confidence level).

[60] The comparable Pearson Rank Order Correlation Coefficients for attendance: 1) at private non-profit institutions are -0.0461 for 15 to 19 year olds (not statistically significant at the 90 percent confidence level), -0.0861 for 20 to 24 year olds (not statistically significant at the 90 percent confidence level), -0.0719 for 25 to 34 year olds (not statistically significant at the 90 percent confidence level), and -0.0544 for 35 to 44 year olds (not statistically significant at the 90 percent confidence level), 2) at public two-year institutions are -0.1913 for 15 to 19 year olds (statistically significant at the 90 percent confidence level), -0.2672 for 20 to 24 year olds (statistically significant at the 99 percent confidence level), 0.0627 for 25 to 34 year olds (not statistically significant at the 90 percent confidence level), and -0.0724 for 35 to 44 year olds (not statistically significant at the 90 percent confidence level), and 3) at private for-profit institutions

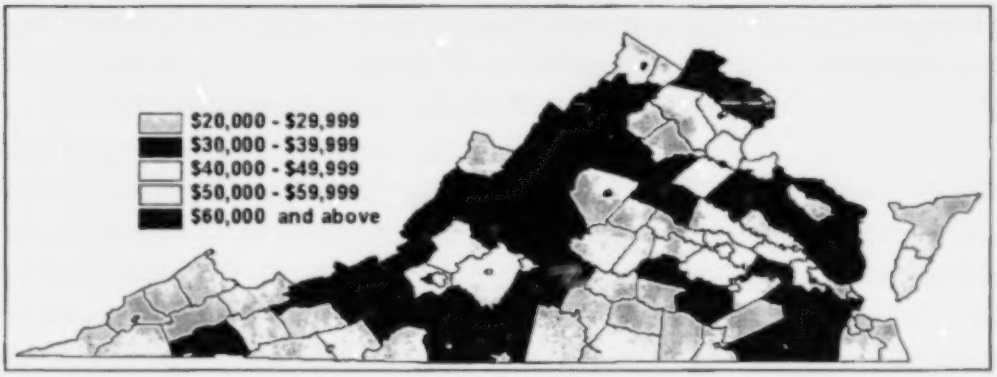

Figure 4-36: Virginia Median Family Income in 2000

Of course income is not the only financial resource available to potential students. Particularly for individuals in lower income categories, state and federal financial aid are also available. Figures 4-37 through 4-39 detail differences in the average 1999-2000 aid package for financial aid recipients by locality of residence. As shown in Figure 4-37, the average financial aid package for students attending public four-year institutions tended to be highest for students coming from localities within the Southern Piedmont, Northern Neck, and Eastern Shore. In contrast, average financial aid packages for students attending private four-year institutions tended to be higher for students coming from localities within the Southwest, Valley, Southern Piedmont, and Northern Virginia (see Figure 4-38). Finally, as shown in Figure 4-39, average financial aid packages for students attending public two-year institutions tended to be highest for those students from localities within the Southwest, Central Virginia, and portions of the Valley, Northern Virginia, and Hampton Roads. In none of these instances, however, was there a statistically significant correlation between the average financial aid package by locality and college attendance rates by locality.

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are –0.0461 for 15 to 19 year olds (not statistically significant at the 90 percent confidence level), -0.0861 for 20 to 24 year olds (not statistically significant at the 90 percent confidence level), -0.0719 for 25 to 34 year olds (not statistically significant at the 90 percent confidence level), and –0.0544 for 35 to 44 year olds (not statistically significant at the 90 percent confidence level).

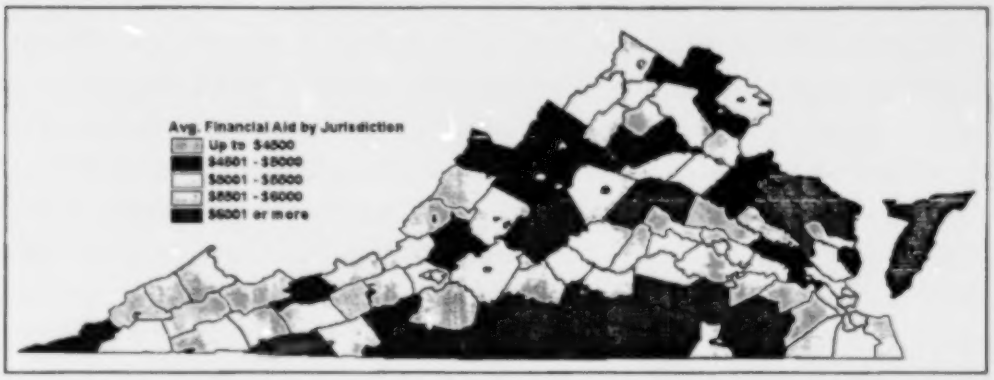

Figure 4-37: Average Financial Aid Package – Public Four-Year Institutions

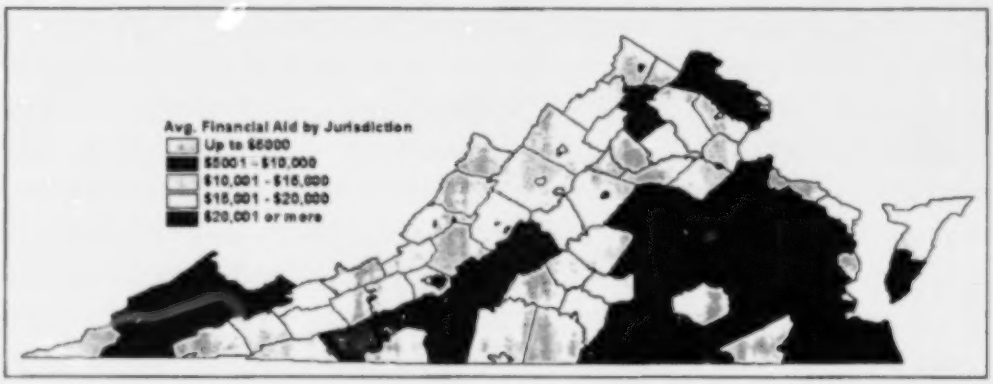

Figure 4-38: Average Financial Aid Package – Private Institutions

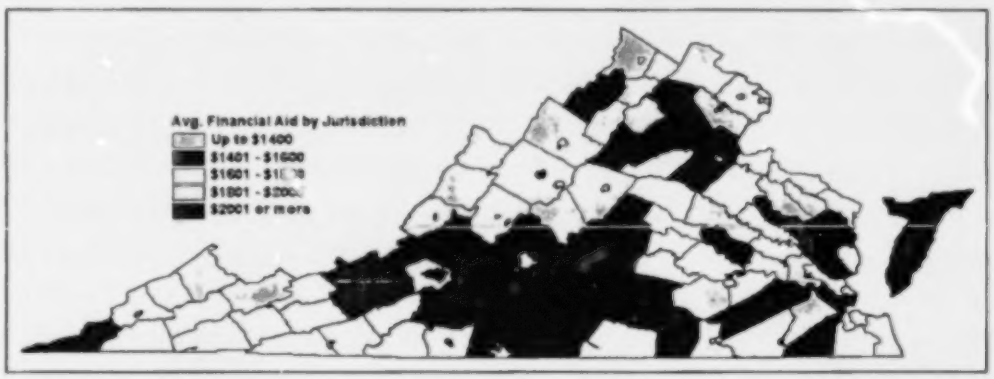

Figure 4-39: Average Financial Aid Package – Public Two-Year Institutions

Summary – Income and Financial Aid

- College attendance rates at public four-year colleges and universities tend to be higher in those localities that have higher family incomes. These localities tend to be in the Roanoke area, Northern Virginia, Central Virginia, and Hampton Roads.

Summary

- Our analysis of underserved populations has shown that, college enrollment rates in four-year colleges and universities in Virginia tend to be highest in the Roanoke area and the I-95/I-64 crescent in the eastern portion of the Commonwealth (Northern Virginia, Central Virginia, and Hampton Roads), and lowest in Southwest Virginia and the Southern Piedmont. Conversely, enrollment rates in public two-year colleges tend to be highest in Southwest Virginia, the Southern Piedmont, and portions of the Valley, and lowest in the eastern portion of the Commonwealth.

- Geographic access may explain at least a portion of these differences. When we analyze enrollment rates in four-year institutions by locality, in light of our GIS drive time analysis, we find that enrollment rates for "non-traditional" students (25 years of age or older) tend to be highest in localities that are within a 30-minute drive of a public or private four-year institution and lowest in those that are not. There are 34 Virginia localities that are not within a 30-minute drive of either a public or private four-year institution. These localities are in Southwest Virginia, the western portion of the Valley, the South Boston and Culpeper areas, Northern Neck, and the Eastern Shore.
- In addition to geographic access, regional differences in employment opportunities and income also appear to have a role in explaining regional differences in enrollment rates. Our analysis shows that there is some support for the assertion that the higher four-year college attendance rates typical of the eastern portion of the Commonwealth are attributable in part to the higher proportion of high skill jobs and higher family incomes characteristic of that area. Conversely, the lower four-year college attendance rates, typical in Southwest Virginia and the Southern Piedmont are attributable, in part, to the nature of the job market and economic factors characteristic of that area.

Chapter 5 – Economic Development

Introduction

Higher education serves as an engine of economic development in at least three ways – research, the commercialization of intellectual capital, and providing an educated and skilled workforce. In this chapter of the System-Wide Needs Assessment we focus on the latter of these and assess whether there are potential future gaps between the number of college graduates Virginia produces each year, and the number it will require to meet the needs of a growing economy.

The information developed in this study has several uses. First, by shedding light on the likely future demand for some categories of instructional programs, the study will aid SCHEV in meeting its statutory responsibility to approve or disapprove new academic programs. It is important to note, however, that estimates of likely demand based exclusively on economic growth will, and should, remain only one of the many criteria SCHEV uses when considering whether to approve proposed new academic programs. The second use for this study is to provide information on the likely demand for instructional programs that Virginia's colleges and universities can use in their own internal strategic planning processes. Finally, it is hoped that this study will provide information to public policy makers that they can use to identify, and proactively deal with, potential future bottlenecks in the supply of skilled labor that could place binding constraints on Virginia's continued economic growth.

Background

The method we use for this study is a demand/supply analysis that compares the likely demand for college graduates, based on projected changes in occupational employment, with the likely supply of graduates, based on SCHEV's most recent data, to identify gaps between the two. The linkage between projected changes in occupational employment and the likely demand for college graduates is accomplished by using a crosswalk developed by the National Occupation Information Coordinating Committee (NOICC) that maps occupations into associated instructional programs. This approach is not new and is currently used by at least six other states to assess the likely future demand for college programs and/or college graduates.[61]

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[61] A survey conducted by SCHEV in February 2001 of other state higher education coordinating and governing bodies indicates that at least six states (California, Georgia, Idaho, Illinois, New Jersey, and

Occupational Employment

To identify likely changes in employment, SCHEV used the most recent occupational employment projections produced by the Virginia Employment Commission (VEC). These projections are for the forecast period 1998 to 2008 and provide statewide data on likely employment changes in over 700 occupations. The VEC projection provides data on the average annual number of openings in each occupation, broken down according to whether they are attributable to new jobs or to personnel turnover in existing jobs. VEC's projections are based on forecasts produced by the U.S. Bureau of Labor Statistics (BLS) using an econometric model that takes into account projections of population demographics, labor productivity, aggregate economic activity, product demand, and other variables known to affect employment.

Figure 5-1 below depicts the ten fastest growing occupations in Virginia according to VEC's projection. In addition, a table listing the 100 occupations that VEC projects will grow the fastest between 1998 and 2008 is provided in Appendix 5-A. As can be seen from both, information technology and health care tend to account for many of the fastest growing occupations.

Utah) use a similar method to assess program and/or graduate demand. In developing the specific method we use here, we have benefited greatly from earlier work by Professors William J. Drummond and Jan L. Youtie of the Georgia Institute of Technology (*see* William J. Drummond and Jan L. Youtie, "Occupational Employment, Demand for College Graduates, and Migration: A Statewide View," a report to the Board of Regents of the University System of Georgia, 1999).

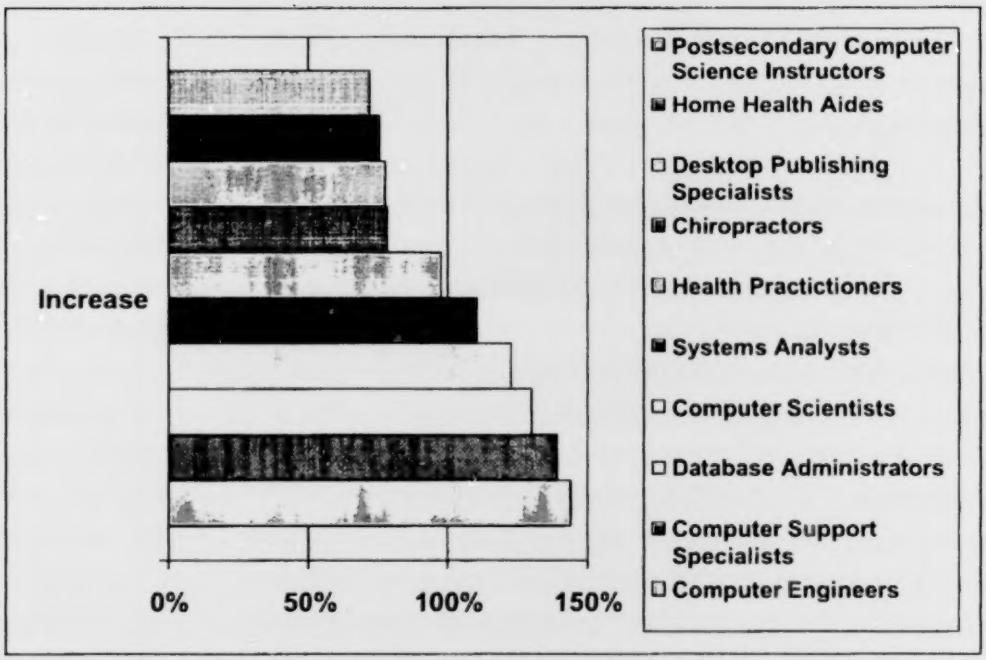

Figure 5-1: Fastest Growing Occupations in Virginia – 1998 to 2008

Because employment in some occupations is much larger than in others, percentage growth can be sometimes be misleading. As a result, in Figure 5-2 we depict the ten occupations that are projected to have the largest number of annual openings between 1998 and 2008. In addition, in Appendix 5-B we provide a listing of the 100 occupations that are projected to have the largest number of annual openings. As these data show, in addition to the information technology and health care fields, even some "slow growth" occupations (in particular, elementary and secondary school teachers) are expected to experience large numbers of average annual openings.

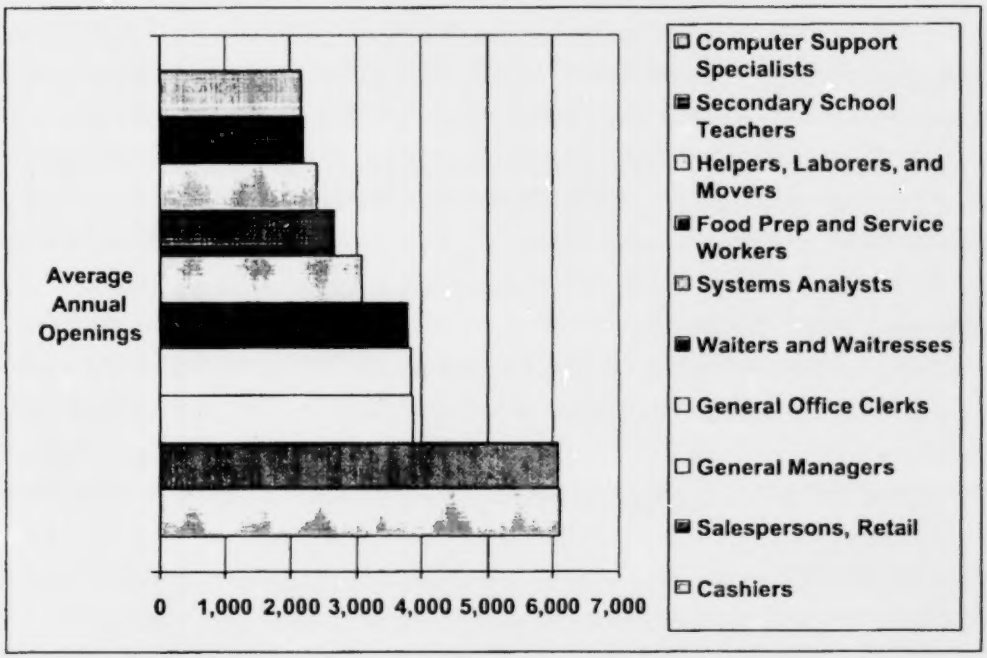

Figure 5-2: Occupations with the Largest Number of Annual Openings 1998 to 2008

Many factors under-gird VEC's occupational employment projections, but one bears special mention – the likely impact of "baby-boomer" retirements over the forecast period. Between 1946 and 1964, 76 million individuals were born in the United States. The demographic tidal wave created by this event has driven most U.S. economic and social trends since. During the period of the VEC occupational employment forecast, the leading edge of this tidal wave will begin to enter into retirement. This outcome will have several implications.

One implication is that there will be a significant increase in the number of employment opportunities available to college graduates. According to the BLS, on average during the 1990s, nationally, 1.31 million college graduates entered the labor force each year to compete for 1.12 million college-level job openings.[62] In other words, the number of graduates exceeded the number of openings by approximately 14.5 percent annually. Over the ten-year period from 1998 to 2008,

[62] "The Outlook for College Graduates, 1998-2008: A Balancing Act," *Occupational Outlook Quarterly*, U.S. Bureau of Labor Statistics, Fall 2000, p.9.

however, BLS projects that, nationally, 1.37 million college graduates will enter the labor force each year to compete for 1.28 million college-level job openings.[63] This means that the gap between openings and graduates will drop significantly – from 14.5 to 6.6 percent.

Moreover, because college graduates are not nearly as occupationally or geographically fungible as these aggregate numbers would seem to suggest, it is possible that already tight labor markets in some professions, and some regions, will become even tighter and openings will become even harder to fill. For example, in a recent publication BLS listed the top ten occupations with the greatest projected retiree replacement needs for 1998-2008.[64] Six of these occupations – elementary school teachers, secondary school teachers, college and university instructors, registered nurses, accounting and auditing clerks, and educational administrators – require at least some college education and, in some instances, are already characterized by severe labor shortages.

Supply of Graduates

To determine the number of graduates produced in Virginia, we used graduation data reported to SCHEV by Virginia's public and private colleges and universities in connection with the U.S. Department of Education's Integrated Postsecondary Education Data System. The data used in this study are for the most recently available academic year, 2000-01. Appendix 5-C provides an ordinal ranking the 100 academic programs that produced the largest number of graduates that year.

Crosswalk

As mentioned earlier, to derive the likely demand for college graduates from projected changes in occupational employment we use a crosswalk maintained by the National Crosswalk Service Center for the National Occupation Information Coordinating Committee (NOICC).[65] This crosswalk maps the relationship between 656 specific occupations, classified according to the U.S. Department of Labor's Occupational Employment Statistics (OES) codes, and 950 individual instructional programs, classified according to Classification of

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[63] *Ibid.*

[64] "Occupations with the Greatest Retiree Replacement Needs, Projected 1998-2008," *Occupational Outlook Quarterly*, U.S. Bureau of Labor Statistics, Spring 2001.

[65] The National Crosswalk Service Center, formerly the NOICC Crosswalk and Data Center, is funded by the U.S. Department of Labor, Employment and Training Administration through the American Labor Market Information System (ALMIS) Database Maintenance Consortium.

Instructional Program (CIP) codes. In some instances the relationships are simple (i.e., a one-to-one correspondence between OES and CIP code) and in some instances they are complex (i.e., a one-to-many, many-to-one, or many-to-many correspondence). Although the NOICC crosswalk maps the relationship between occupations and instructional programs, however, it does not provide information on the distribution of graduates from each instructional program across occupations. As a result, in this study we assume that graduates from each instructional program are distributed across related occupations in proportion to the projected average annual openings in those occupations.

Limitations

There are at least three limitations to this study that are important to keep in mind. The first is that the scope of our analysis is limited by the instructional programs and occupational employment categories contained in the NOICC crosswalk. This means, for instance, that graduates in instructional programs that are not linked to specific occupations in the NOICC crosswalk are not included in the analysis. These instructional programs typically fall into areas such as General Studies and Liberal Arts that, even though they are widely recognized for producing graduates with critical thinking skills that are in demand by employers, are, nonetheless, difficult to map into specific occupations. This limitation is significant because the number of graduates from these programs is typically non-trivial. For instance, in 2000-01 2,708 of the 9,635 associate degrees and 1,170 of the 32,129 bachelor's degrees awarded in Virginia were in either General Studies or Liberal Arts.

In addition, employment increases in occupations that are not linked to specific instructional programs in the NOICC crosswalk are not included in the analysis. These occupational categories are also typically general in nature (*e.g.*, Administrative Support Supervisors and Marketing and Sales Supervisors) and, therefore, difficult to map into specific instructional programs.

A second limitation is that the accuracy of our analysis is contingent on the accuracy of VEC's occupational employment projections and the accuracy of the NOICC crosswalk. As with all econometric forecasts, VEC's occupational employment projections are predicated on the assumption that history is a good predictor of the future. Even under normal circumstances that assumption is more likely to hold in occupations where change takes place slowly than in occupations that are more volatile. For example, a recent study of the high tech industry in Virginia found that employment in that industry tended to decline faster during recessions and increase faster during recoveries than the statewide average for all

industries.[66] This kind of volatility increases uncertainty and makes employment in these occupations more difficult to project accurately.

Moreover, the economic uncertainty fostered by the tragic events of September 11, 2001 has further called into question the assumption that tomorrow can be accurately predicted on the basis of yesterday. As case in point, a recent news release from the National Governor's Association indicated that three organizations – the American Enterprise Institute, the Brookings Institute, and the National Association of Homebuilders – have revised their economic forecasts to reflect the belief that, "the [U.S.] economy, which was on the brink of a recession before September 11's attacks, will most likely fall into a recession."[67] The VEC occupational employment projection used in this study predates the September 11 attack and has not benefited from subsequent revisions. A telling example of this can be seen in the fact that the VEC projections forecast a 45 percent increase in the number of Flight Attendants between 1998 and 2008 – an outcome most would now consider unlikely.

Finally, it is likely that the NOICC crosswalk will also tend to be more accurate in some areas than in others. One reason for this is the complex relationship between some instructional programs and associated occupations. In addition , the CIP codes are subject to broad interpretation, and, as a result, there is some amount of inconsistency in the way that degree programs are categorized. In other words, different institutions sometimes assign different CIP codes to programs having essentially the same academic requirements.

A third limitation is that the study implicitly assumes that all college-level job openings in Virginia are filled by Virginia college graduates. In other words, it does not take into account the effect of migration into the Commonwealth by college graduates who received their degrees elsewhere, or migration out of the Commonwealth by recent Virginia graduates. This limitation is particularly problematic in the northern Virginia information technology field where many jobs are filled by in-migration, or by residents of neighboring states. Unfortunately, however, the primary source for such data are U.S. Census files (*i.e.*, the Public Use Microdata Five Percent Sample files) that are being revised in light of 2000 Census and will not be released until sometime in 2003.

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[66] Chistine Chmura and Ann M. Battle, "An Overview of the High-Tech Industry in Virginia," a report prepared for Virginia's Center for Innovative Technology by Chmura Economics and Analytics, August 4, 2000.

[67] "New Economic Forecasts Incorporate September 11 Effects," National Governor's Association, web document, www.nga.org/center/frontAndCenter.

Findings

Using the data elements and method discussed in the previous section, we compared the number of college graduates Virginia produced in 2000-01 by instructional program to the number of average annual openings in associated occupations. We then further restricted the analysis to exclude all occupations that are not classified by BLS as requiring an associate degree or higher, or are classified as requiring work experience in addition to a degree.[68] Table 5-1 provides an ordinal ranking of those occupations where we found that the number of openings exceeded the number of graduates by at least 100.

In all, 25 occupations fell into this category. Of these 25, five (computer support specialists, dental hygienists, electrical and electronic engineering technicians, paralegal personnel, and physical therapy aides) are categorized by BLS as requiring at least an associate degree, two an advance degree (physicians and surgeons and professional librarians), and the remaining 18 at least a bachelor's degree. As Table 5-1 shows, the largest gaps occurred in information technology (systems analysts, computer engineers, and computer support specialists) and teaching (preschool, elementary, and secondary). Given the limitations to this study discussed earlier, it may be that some of the gaps listed in Table 5-1 are, in fact, more apparent than real. However, the data presented in Table 5-1 do serve to identify areas of concern that warrant subsequent, more detailed, analysis.

[68] As part of its occupational employment data BLS classifies occupations according to 11 education and training categories. The first six of these are: first professional degree, doctoral degree, master's degree, work experience plus a bachelor's degree or higher, bachelor's degree, and associate degree.

Table 5-1: Occupations Where Average Annual Openings Exceed Graduates by more than 100

Occupation	Graduates – Private						Graduates – Public						Total Grads.[69]	Avg. Annual Openings	GAP
	Assoc.	Bach.	Master's	Doc.	1st Prof.	Total	Assoc.	Bach.	Master's	Doc.	1st Prof.	Total			
Systems Analysts, Electronic Data Processing:		69	14			82		583	251	17		1,227	1,309	3079	1,770
Computer Engineers:		13				14		355	67	1		423	437	2142	1,705
Computer Support Specialists:	1	21	9			31	224	214	58			497	528	2184	1,656
Teachers, Secondary School:		141	65	2		207		402	380	27		816	1,022	2198	1,176
Teachers, Elementary School:		100	181	1		282		37	329	16		387	670	1659	989
Teachers, Preschool:			6			6			28	6		35	41	613	572
Purchasing Agents, except Wholesale, Retail, and Farm Product														303	303
Sales Agents and Placers, Insurance:														266	266
Loan Officers and Counselors:		5				5		124				124	130	394	264
Residential Counselors:														264	264

[69] Totals may not equal sum of components, due to rounding.

Table 5-1: Occupations Where Average Annual Openings Exceed Graduates by more than 100 (cont.)

Occupation	Graduates – Private						Graduates – Public						Total Grads.[70]	Avg. Annual Openings	GAP
	Assoc.	Bach.	Master's	Doc.	1st Prof.	Total	Assoc.	Bach.	Master's	Doc.	1st Prof.	Total			
Personnel, Training, and Labor Relations Specialists:		253	58	13		325							325	572	247
Electrical and Electronic Engineers:								222	90	27		339	339	583	244
Sales Agents, Securities, Commodities, and Financial Service														231	231
Physicians and Surgeons:					101	101					301	301	402	632	230
Data Base Administrators:		13	2			15		117	46	2		221	236	451	215
Electrical and Electronic Engineering Technicians							174	6				180	180	389	209
Paralegal Personnel:	22	20	6			48							48	252	204
Public Relations Specialists and Publicity Writers:			0			0							0	197	197

[70] Totals may not equal sum of components, due to rounding.

Table 5-1: Occupations Where Average Annual Openings Exceed Graduates by more than 100 (cont.)

Occupation	Graduates – Private						Graduates – Public						Total Grads.[71]	Avg. Annual Openings	GAP
	Assoc.	Bach.	Master's	Doc.	1st Prof.	Total	Assoc.	Bach.	Master's	Doc.	1st Prof.	Total			
Librarians, Professional:														181	181
Teachers, Kindergarten:			2			2			7	2		9	11	163	152
Property and Real Estate Managers and Administrators:														142	142
Employment Interviewers		37	4			41							41	180	139
Physical and Corrective Therapy Assistants and Aides:		3				3							3	141	138
Cost Estimators:														124	124
Dental Hygienists:							52	48	1			101	101	223	122

[71] Totals may not equal sum of components, due to rounding.

Summary

- SCHEV has used a demand/supply analysis that compares the likely demand for college graduates with the likely supply to identify potential gaps between the two. This approach is not new and is currently used by at least six other states to assess the likely future demand for college programs and/or college graduates.

- The purpose of this analysis is threefold: 1) to provide information that SCHEV can use, along with other data and criteria, in meeting its statutory responsibility to approve or disapprove new academic programs, 2) to provide information that Virginia's colleges and universities may find useful for internal strategic planning purposes, and 3) to provide information to decision makers in the Governor's Office and the General Assembly that they can use to identify, and proactively deal with, potential future bottlenecks in the supply of skilled labor that could place binding constraints on Virginia's continued economic growth.

- Our findings indicate that there may be significant gaps between the number of college graduates Virginia produces and the number it requires in two key areas – information technology (systems analysts, computer engineers, and computer support specialists) and teaching (preschool, elementary, and secondary).

Chapter 6 – Learning Technology

Introduction

In this chapter, we provide information on the current state of distance education in Virginia and some of the issues that are likely to affect its development in the future. The purpose of this chapter is to inform discussions on where and to what extent, "e-learning" can be used to compliment and extend existing access to Virginia higher education.

Current State of Distance Learning

National Context

Distance Learning has been around for a long time under various terminology, starting with correspondence courses, courses delivered via educational television stations, then satellite delivered instruction and now finally computer mediated/delivered instruction in both synchronous and asynchronous forms. Until recently, the primary goal of distance learning efforts was to provide education programs to places where there were no higher education institutions within a reasonable driving distance or for persons seeking degrees in an area not being offered through institutions within a reasonable driving distance. Now, even students living on a residential campus sometimes choose to take sections of courses being delivered over the internet either for convenience or for access purposes.

The U.S. Department of Education has reported that the number of distance learning programs increased 72 percent between 1995 and 1998. Early pioneers such as the Western Governors University founded in 1995 have struggled for some time and had difficulty in securing accreditation. The planners of the institution sought to create a very different kind of program of study that focused on competency development rather than course credit accumulation. On the other hand, Michigan Virtual University grew out a virtual automotive college and has achieved some success as a private, non-profit university that is flexible and responsive to market driven forces.

The British Open University has come to America as the Open University and has begun offering course work delivered via the internet. Phoenix University, which has become a national institution, delivers both virtual and on-site instruction with brick and mortar sites as well as distance learning degree programs offered over the internet. Phoenix University operates in many states

and is in the process of seeking approval to operate in Virginia. The Kentucky Commonwealth Virtual University (KCVU) was created in 1997 with the specific goal of increasing access to higher education and to make Kentucky's citizens more competitive in today's economy. KCVU offers a "one-stop" shopping approach to the delivery of distance learning programs and degrees. Kentucky clearly sees the importance of making higher education accessible to all Kentuckians regardless of the remoteness of their residence.

Virginia Context

Virginia has deliberately allowed individual institutions to drive the development of distance learning programs with little coordination at the statewide level. In the 1999 Acts of Assembly (Item 127.E. of Chapter 935) of Virginia, a Distance Learning Steering Committee (DLSC) was created to serve in an advisory capacity to the Governor and General Assembly on distance learning, with the objective of making course and degree programs more accessible through distance learning for Virginia.

The DLSC was charged with making recommendations of appropriate policies for implementing and delivering academic courses and programs between and among the various institutions of higher education through electronic media, assessing the benefits of using electronically delivered instruction, developing recommendations related to transfer of credits, appropriate tuition rates and transfer of tuition funds, including exploration of incentives to increase the number of courses offered via distance learning.

The DLSC surveyed the national landscape in distance learning to get a better picture of what could be learned that could guide Virginia's efforts in this area. DLSC recognized that the internet and other digital developments could make it possible for all Virginia students to experience a new education reality – access to high-caliber learning experiences at times and places of their choice and at affordable rates. Clearly, individual Virginia institutions, particularly, Old Dominion University (with TELETECHNET) and Virginia Tech, are heavily engaged in delivering course work and degrees via distance learning. However, there was little or no coordinating effort or championing of the use of distance learning at the state level.

The DLSC, chaired by Secretary of Education Wilbert Bryant, made a number of recommendations including:

- SCHEV and the Electronic Campus of Virginia (ECVA) should consult on the role that distance learning might play in the development of SCHEV's

System-Wide Needs Assessment to evaluate both the demand for, and the supply of, higher education services in the Commonwealth of Virginia;

- Creation of an incentive pool of funds for the development of unique, specialized distance learning programs or high-demand programs that meet specific economic needs;
- Modification of course transfer policies in order to better accommodate the unique needs of distance learning programs.

In response to the recommendation regarding transfer policies, at its March 2001 meeting, the State Council of Higher Education passed the following resolution designed to address the transfer of distance learning course work: "Course content, not method of course delivery (pedagogy), should be the primary determining factor in the acceptance of credit in transfer between Virginia's two- and four-year public colleges and universities." However, more remains to be done in transfer policy, despite the course delivery method. This continues to be a high priority of the Council.

Current State of Distance Learning in Virginia

Rather than attempt to catalog the options of distance education here, which would actually be contrary to the nature of the ever-changing face of distance learning, we will begin by providing links to existing online catalogs and then proceed to describe the level of activity taking place in Virginia higher education.

The first site we list is ECVA (http://www.vacec.bev.net/). Here, one can search using multiple criteria to identify distance-learning courses from participating institutions. These criteria include the institution providing the course, and the program area. Many of the residential institutions offering distance-learning courses in conjunction with ECVA report a high percentage of their enrollments in these courses are comprised of students living on campus. Students take these courses for convenience, because they could not get into a section of the course on campus, or because they like the internet mode of instruction and feel that they learn more through this approach.

Among the courses listed at the ECVA site are the wide-ranging offerings of Old Dominion University's (ODU's) TELETECHNET program (http://www.odu.edu/webroot/orgs/ao/dl/teletechnet.nsf). Through its TELETECHNET programs, ODU provides a very extensive set of course work to remote areas within the Commonwealth of Virginia, other parts of the United States, and around the world to American military bases, ships, etc. ODU keeps expanding, not only TELETECHNET's service area, but also its modes of delivery (i.e., courses delivered over the internet). Importantly, TELETECHNET,

through the use of community college facilities, is able to offer degree programs to some of the more remote areas of Virginia.

Through TELETECHNET, students are able to earn either bachelor or master's degrees. It is assumed that baccalaureate students complete their first two years at a local community college or other accredited institution. Available degree programs, admission requirements, and degree requirements are easily found on the ECVA site. While enrollment statistics are not available on the site, enrollments in TELETECHNET courses are reported to SCHEV. Enrollments for 1996-97 through 2000-01 are listed below in Table 6-1.

Table 6-1: TELETECHNET Headcount Enrollment

	1996-97	1997-98	1998-99	1999-00	2000-01
TELETECHNET	10,330	14,069	15,606	16,958	17,662

As one can see, not only are enrollments in TELETECHNET substantial, it is a growing enterprise with a 71 percent increase in enrollment over the last five years. The bulk of these courses are satellite courses that still require the student to attend class at a nearby center. While this still is a great advantage over having to attend a four-year college or university some distance away or out of state, it is not as flexible as course offerings via the internet.

The Virginia Community College System (VCCS) is also a major player in distance-learning with offerings listed at http://www.so.cc.va.us/vccsonline/index.html. At this link, one will find that 34 complete programs are offered using a variety of distance learning modes as well as in-depth statistics on enrollment from Fall 1997 up to Fall 2000. In discussing distance-learning metrics for VCCS it is important to note that VCCS makes a distinction between synchronous and asynchronous courses. Synchronous courses are those that take place at the same time and date as the course at the main site. Alternatively, asynchronous courses are those that are taken anywhere, anytime. Table 6-2 details headcount enrollment in VCCS' distance education classes for the period from 1996-97 through 2000-01.

Table 6-2: Headcount Enrollment in VCCS Distance Education Classes

Synchronous Courses					
	Distance Education Only	Distance Education and Regular Classes	Total Distance Education	Total Enrollment	Distance Education as a % of Total Enrolment
2000-01	518	3,538	4,056	224,215	1.8%
1999-00	432	3,385	3,817	223,370	1.7%
1998-99	573	4,201	4,774	219,224	2.2%
1997-98	455	2,674	3,129	215,709	1.5%
1996-97	209	1,030	1,239	206,260	0.6%
Asynchronous Courses					
	Distance Education Only	Distance Education and Regular Classes	Total Distance Education	Total Enrollment	Distance Education as a % of Total Enrolment
2000-01	8,872	22,936	31,808	224,215	14.2%
1999-00	6,892	19,076	25,968	223,370	11.6%
1998-99	5,159	14,991	20,150	219,224	9.2%
1997-98	3,781	9,922	13,703	215,709	6.4%
1996-97	1,064	4,186	5,250	206,260	2.5%
All Courses					
	Distance Education Only	Distance Education and Regular Classes	Total Distance Education	Total Enrollment	Distance Education as a % of Total Enrolment
2000-01	9,525	25,193	34,718	224,215	15.5%
1999-00	7,478	21,032	28,510	223,370	12.8%
1998-99	5,835	17,973	23,808	219,224	10.9%
1997-98	4,281	12,008	16,289	215,709	7.6%
1996-97	1,282	5,018	6,300	206,260	3.1%

It is interesting to note that 15.5 percent of VCCS' nearly quarter million students take some type of distance learning course.

A significant component of distance learning in Virginia is the Commonwealth Graduate Engineering Program (CGEP). Through CGEP engineers are able to seek and obtain graduate degrees in engineering in three to five years using satellite site synchronous distance learning techniques. CGEP courses originate at George Mason University, Old Dominion University, University of Virginia, Virginia Commonwealth University, and Virginia Tech. Selected institutions function as hosts and provide administrative services. These include George Mason University, Longwood College, Mary Washington College, Old Dominion University, Shenandoah University and Virginia Commonwealth University. The host institutions also offer support courses in mathematics, computer science, and engineering to support the electronic offerings. There are 20 receiving sites for CGEP. These are located within such organizations as the federal government, community colleges and higher education centers. To receive courses, arrangements can be made each semester to accommodate corporations that have the necessary equipment. The majority of the CGEP courses originate from the University of Virginia and Virginia Tech.

On the private sector side, Liberty University and Shenandoah University also have substantial distance education offerings. Liberty relies heavily on videotape offerings and exceeds 12,000 enrollments per year. The final major player in distance education in Virginia is the Southern Regional Education Board Electronic Campus (SREC) (http://www.electroniccampus.org/). Like the ECVA, the SREC does not offer degrees, programs, or courses of its own. Instead, it acts as a clearinghouse and point of contact for students and potential students. Degrees are available through the member institutions that also control admission to the courses in the SREC.

When reviewing distance learning in Virginia, one thing is abundantly clear: despite the detail of unit record data collection at SCHEV, there is not enough information available about what is happening and what is available via distance education at Virginia institutions. For example, in comparing institutional information submitted to SCHEV regarding the degree programs offered, particularly those available as "telecommunicated," and the institutional catalogs, it is difficult to reconcile the differences and thus make any definitive comment about what's available in distance education. Additionally the distance education sites themselves offer little in the way of statistics and demographics regarding their student bodies. Nor, do they offer information on the number of enrollees and how many institutional graduates have at least one distance learning experience on their transcripts.

It is also clear that SCHEV, as the statewide coordinating body, needs to take a deliberate approach to measuring and reporting distance learning activities in the state. Distance learning engagement may be the most significant change in higher education to impact Virginia students in the next decade. Our ability to describe and measure that impact will have to improve in order for SCHEV to help affect the direction of distance learning in the Commonwealth.

The Future of Distance Learning

Predicting the future of distance learning is a chancy business at best. There are, however, some trends that we can use as a roadmap to the future.

As is obvious from the beginning of this chapter, distance and on-line learning are very much growth industries. The report "The State of E-Learning in the States" provides an idea of the scope nationally and its anticipated growth. For instance, the total dollar value of e-learning products and services was estimated at 7.1 billion dollars per year and is projected to reach over 40 billion dollars by 2005. In addition, surveys have also identified that "customers are shifting away from stand-alone courses" in favor of total packages. The convenience of anytime, anywhere education is too great to be ignored for place-bound or opportunity-bound learners.

As evidenced by the activities described earlier, distance learning in Virginia is a growth industry as well. In addition, the State Council of Higher Education recently endorsed the creation of a virtual university by July 2003. In October 2001, SCHEV directed the development of an implementation plan for a Virginia Virtual University with corresponding legislation to be submitted for consideration in the 2003 session of the General Assembly. The proposed Virginia Virtual University would be an umbrella institution with the ability to grant degrees while offering no courses of its own but instead building upon all the offerings, traditional, distance, and online, of the state and beyond. Such an institution would provide the impetus to spur existing institutions to develop more distance offerings, thus allowing more place-bound, job-bound, and opportunity-bound citizens of the Commonwealth to complete college degrees where they live.

For example, while four-year institutions are not available on the Eastern Shore or in Southwestern Virginia, there are community colleges available that provide access to TELETECHNET and online libraries as well as the other facilities that support higher study. As proposed, the Virginia Virtual University would allow students in these areas to develop individualized studies programs leading to degrees at the associate, bachelor, or master's level with concentrations of studies that met their needs. This is a particularly interesting scenario for the

Eastern Shore since its population and location may not support a four-year institution. By taking advantage of existing infrastructure and overlaying a virtual institution that brings degree options beyond the associate using a variety of distance learning media and a greater variety of offerings, the local communities could be well served without building a new institution.

Creation of a virtual university by itself does not solve all the problems related to accessibility and growth in these communities. It does create a statewide stimulus for increasing distance education offerings and support. Realistically the state would also need to invest resources in the ongoing work of creating distance education offerings and training faculty and staff in this work. The ideal model would respect the traditional education base, but at the same time provide opportunities to citizens who might not otherwise have access to a higher education.

In the proceedings of SCHEV's 1998 Distance Learning Forum, there was general agreement among forum participants that it was not the right time to create a virtual university. The operable question now is, has that time come? As we look to the future, accessibility, affordability, and quality continue to be the keywords of Virginia higher education policy. Through the effective leveraging of technology in programs of online learning, traditional forms of education, and an emphasis on brokering learning, or perhaps just creating more connections between institutions and students that are not dependent on place, we can better meet citizen's needs, especially in underserved areas.

Summary

- As demonstrated through its rapidly increasing enrollment, distance learning is a growth industry in Virginia.
- Distance learning has the potential to reach underserved or place-bound populations and deliver otherwise unavailable quality educational experiences.
- Distance learning impacts not only non-traditional students, it also impacts traditional students who take online courses from their residence halls and are thus able to move through the system more quickly by finding more options that fit in their schedule.
- A proposed virtual university has the potential for expanding all these benefits and experiences.

Chapter 7 – Conclusion and Next Steps

In this concluding chapter of the System-Wide Needs Assessment, we review the major findings from this analysis with respect to the supply of, and demand for, higher education services in the Commonwealth, and potential gaps between the two. In addition, we briefly discuss a list of potential policy responses to the issues raised in this portion of the strategic planning process. This list will provide a starting point for development of the 2003 System-Wide Strategic Plan for Virginia Higher Education in which SCHEV, in partnership with Virginia's colleges and universities, public policy makers, and other interested parties, will develop and propose strategic planning initiatives that identify the types of incentives and resources that will be necessary to meet Virginia's current and projected higher education needs, programmatically and geographically.

Summary of Findings

1. Virginia will experience a significant increase in higher education enrollment demand between 2001 and 2010.

System-wide, Virginia's public and private institutions of higher education can anticipate approximately 38,296 additional undergraduate and graduate students between now and fall 2010. All else equal, enrollment increases in the public four-year colleges and universities will likely account for at least 18,899 of these students, or 50 percent of the total projected increase. Enrollment increases in the public two-year institutions, primarily the Virginia Community College System, will likely account for 12,712 students, or 33 percent of the projected increase. Finally, enrollment increases in Virginia's private colleges and universities will likely account for 6,685 students, or the remaining 17 percent of the projected increase.

This increase in enrollment demand is being driven by the "echo-boom" – the children of the "baby-boom" generation who are now entering their peak college attendance years. This means that much of the increased enrollment will be comprised of "traditional-aged" students – those between the ages of 18 and 24. In addition, we know from available projections of high school seniors that almost all of this growth will originate in a handful of localities located in the I-95/I-64 crescent in the eastern portion of the Commonwealth. In combination these two factors strongly imply that colleges and universities whose institutional missions are geared toward serving "traditional-aged" students, and who draw a large proportion of their students from the I-95/I-64 crescent, are likely to experience

the greatest increase in enrollment demand. The one category of institutions that meet both of these criteria is Virginia's public four-year institutions.

2. Virginia's inventory of current and authorized higher education facilities is inadequate to absorb the anticipated increase in enrollment demand between 2001 and 2010.

Assuming no additional construction beyond that already financed, by the end of the decade (FY 2011) enrollment in Virginia's public four-year colleges and universities will likely outstrip their aggregate enrollment capacity by somewhere between 9,172 and 14,466 students. In addition, this aggregate enrollment capacity estimate pertains only to instructional and academic support space and does not include potential constraints in areas such as dormitory space and student services.

Moreover, it is important to note that this aggregate, or "net," enrollment capacity estimate implicitly assumes that capacity is perfectly fungible – a capacity surplus in one institution "cancels out" a capacity deficit in another. Although there is in some cases substantial overlap in the geographic regions from which institutions draw their students and students typically apply to multiple Virginia institutions (*see* Appendix 7-A), it is still unrealistic to assume that prospective students view all individual institutions as close substitutes and, as a result, that students will always migrate to those institutions that have available space. This means that existing enrollment capacity deficits, particularly in institutions that draw a large proportion of their students from the high growth I-95/I-64 crescent, are particularly problematic. It also means any "net" enrollment capacity deficit almost certainly understates the true magnitude of the capacity shortfall that Virginia's public four-year institutions are likely to face in the latter half of this decade.

Our analysis also shows that Virginia's community colleges face an even more severe space shortage than the public four-year colleges and universities. According to our estimate, enrollment in these institutions is currently somewhere between 1,557 and 6,660 students above their aggregate enrollment capacity. Moreover, projected increases in enrollment are likely to substantially exacerbate this situation. By the end of the decade (FY 2011), assuming no additional construction beyond that already financed, this gap will rise to somewhere between 7,827 and 13,189 students.

In addition, whereas Virginians who are not accepted at one public four-year institution often gain admission to another, enrollment in the community colleges is inherently local. Consequently, it is exceedingly unlikely that

enrollment capacity surpluses in one community college will "cancel out" enrollment capacity deficits in another. This means that the "net" enrollment capacity deficits detailed in the previous paragraph almost certainly understate the true magnitude of the capacity constraints that the two-year public institutions are likely to face this decade.

As opposed to the public four-year and two-year institutions, however, it appears that the private non-profit institutions may have additional enrollment capacity. According to survey responses from these institutions, in the aggregate, they estimate that they have the capacity to absorb an additional 6,400 students currently, and an additional 17,200 students by 2010.

3. Attendance rates at four-year colleges and universities tend to be lower in Southwest Virginia and the Southern Piedmont than they are in the rest of the Commonwealth.

Our analysis indicates that college attendance rates at four-year institutions (public and private combined) tend to be highest in the Roanoke area, Northern Virginia, Central Virginia, and Hampton Roads, and lowest in Southwest Virginia and the Southern Piedmont. In an almost mirror image, college attendance rates at two-year institutions, comprised mainly of the community colleges, tend to be highest in Southwest Virginia, the Southern Piedmont, and the southern portions of the Valley, and lowest in the eastern portion of the Commonwealth. A number of factors may influence these differences in college attendance rates. Some of these, such as regional culture, are nearly impossible to quantify. Others are more amenable to statistical analysis.

Geographic access may explain at least a portion of the differences. When we analyze enrollment rates in four-year institutions by locality, in light of our Geographic Information System (GIS) drive time analysis, we find that enrollment rates for "non-traditional" students (25 years of age and older) tend to be lowest in localities that are not within a 30-minute drive of either a public or private four-year institution. Thirty-four Virginia localities, primarily located in Southwest Virginia, the western portion of the Valley, the South Boston and Culpeper areas, Northern Neck, and the Eastern Shore, fall into this category.

In addition to geographic access, regional differences in employment opportunities and income also appear to play a role. For example, our analysis shows that there is some support for the assertion that the lower four-year college attendance rates seen in Southwest Virginia and the Southern Piedmont are attributable in part to the higher proportion of low skill jobs and lower family incomes characteristic of that area.

4. **There may be significant gaps between the number of college graduates Virginia produces each year and the number it requires in two key areas – information technology and preschool, elementary, and secondary teaching.**

Higher education serves as an engine of economic development in at least three ways – research, the commercialization of intellectual capital, and by providing a well-educated and well-trained workforce. Focusing on the latter of these, we compared the number of college graduates Virginia produces in specific instructional programs to the number of average annual openings in associated occupations. This analysis identified 25 occupations where a potential shortage of graduates exists. The most significant gaps appear to be information technology (systems analysts, computer engineers, and computer support specialists) and teaching (preschool, elementary, and secondary).

Potential Responses

In order for the Commonwealth to position itself to meet the challenges described in the preceding section – projected increases in enrollment demand, providing adequate access to higher education services in rural communities, and producing the graduates that Virginia needs to fuel its growing economy – it must be proactive in developing strategic responses. Moreover, in most cases these challenges will not be amenable to a single solution and multiple responses will be required. As a first step in this process we offer the following non-exhaustive list of potential strategic responses. This list will provide a starting point for development of the 2003 System-Wide Strategic Plan for Virginia Higher Education. In partnership with Virginia's colleges and universities, state policy makers, and other key constituents, SCHEV will develop and propose strategic planning initiatives and identify where resources will be needed to meet Virginia's current and projected higher education needs (both programmatically and geographically).

1. **Support additional capital construction in the public institutions.**

One solution to the enrollment capacity shortfall that Virginia faces in its public colleges and universities over the 2001-2010 decade would be to fund construction of additional facilities. As part of its system-wide 2002-2004 higher education budget recommendations to the Governor and the General Assembly, SCHEV has called for a "capital catch-up package" to address both the accumulation of previously unfunded priority capital outlay projects and newly

identified capital needs. This package recommends a total of $970 million in additional general fund support for critical needs in equipment ($19 million), renovations, repairs, and improvements ($336 million), and new construction ($615 million). It is important to note that 75 percent of the projects included in the $615 million recommended for new construction are fully justified on the basis of current or projected 2006 enrollment. If approved by the Governor and the General Assembly, this proposed "capital catch-up package" would place Virginia in a better position to accommodate current and projected enrollment in the public institutions.

However, although new capital construction is perhaps the simplest solution to meeting the increased enrollment demand, it is not the only solution. Alternatives exist for accommodating projected enrollment growth and, to ensure that public resources are used as effectively as possible, they should be evaluated in combination with additional capital outlay.

2. Make better use of existing enrollment capacity within the system.

Another solution to the problem of insufficient enrollment capacity in the public sector would be to make better use of existing enrollment capacity within the system as a whole, particularly that which appears to exist within Virginia's private non-profit colleges and universities. There are several ways in which this could be done.

One would be to increase the level of Virginia's Tuition Assistance Grant (TAG). TAG is a grant provided to Virginia residents attending Virginia private colleges and universities that is intended to partly offset the difference between public and private tuition. Increasing TAG would provide a financial incentive that might divert a portion of the enrollment increase projected for Virginia's public four-year institutions into private Virginia non-profit colleges and universities. This could serve to mitigate a portion of the enrollment capacity shortfall projected for the public institutions. Additional analysis would be required, however, to determine the efficacy of this approach.

Another alternative would be to encourage, through financial incentives or otherwise, partnerships between public and private institutions, and/or four-year and two-year institutions, that would take advantage of any existing capacity within the system.

3. Use learning technology in combination with existing facilities to enhance access in Southwest Virginia and the Southern Piedmont.

There are several potential solutions that should be evaluated in regard to the issue of lower four-year college and university enrollment rates in Southwest Virginia and the Southern Piedmont. The least costly of these would be to take advantage of existing community college facilities within these regions and provide upper level courses through programs like Old Dominion University's TELTECHNET, or over the internet. This approach would take maximum advantage of existing higher education capital investments in the region. In addition, it would offer greater flexibility in that programs could easily be adapted to changing conditions. In the alternative, enhanced access to four-year institutions could also be provided through investment in new satellite campuses or additional higher education centers that would provide a combination of on-site and learning technology courses.

4. Provide incentives for institutions to increase the proportion of in-state students they enroll.

Currently, Virginia law requires that out-of-state tuition must be at least equal to the cost of a student's education. From a practical perspective, this means that, per capita, out-of-state students provide more revenue to institutions than in-state students. This creates a financial incentive for institutions to favor out-of-state enrollment over in-state enrollment. In fall 2000, Virginia's public four-year institutions enrolled 37,838 out-of-state students. These students comprised 21.5 percent of overall enrollments. Another solution to the impending enrollment capacity shortfall in the public four-year colleges and universities would be to revise the existing tuition policy by creating incentives that would reward institutions for accepting a larger proportion of in-state students. However, any such revision to the current tuition and fee policy should be crafted in such a way that it does not negatively impact the ability of affected institutions to ensure a diverse student environment or their development efforts.

5. Place a credit hour limit on in-state tuition.

In most cases, financial aid subsidies are tied to an expectation that students will complete their college education in a timely manner. Another potential solution to the impending enrollment capacity shortfall would be to make the substantial subsidy inherent in public college tuition contingent on a similar expectation. Placing a credit hour limit on in-state subsidy may provide students

with an incentive to complete their degree requirements in a timely manner, thus reducing the need for additional enrollment capacity and capital investment.

6. Reduce transaction costs in the relationship between higher education and business by providing a centralized source of information.

Labor markets are notoriously "sticky" and slow to respond to changes in wages and other market conditions. One way to prevent potential labor market "bottlenecks" is to provide information that reduces the search costs of market participants. In its agency budget submission for the 2002-04 biennium, SCHEV has requested funding for the development of three interactive web sites that would address this need.

- *Where the Jobs Are* would provide career development information to middle-schoolers and others on occupations that are likely to experience significant job growth in the future, the average salaries for those jobs, where they are likely to be located, associated educational requirements, and which institutions offer those academic programs. Such a site would significantly enhance Virginia's ability to "grow" its labor force.

- *Where the Graduates Are* would be patterned after similar programs in New Jersey and Georgia where employers are provided a searchable data base that lists, by category, recent graduates from the public (and private) institutions of higher education. The site also provides resumes to prospective employers and gives them contact information for the individuals listed. This information would significantly reduce business recruitment costs and may also provide a "Virginia first" bias for new hires.

- *Where the Intellectual Capital Is* would leverage ongoing efforts at the Center for Innovative Technology to provide a searchable database listing faculty experts, on-going research, patents, and copyrights.

7. Provide incentives to increase the number of graduates in critical fields.

Another alternative for closing potential gaps between the number of graduates Virginia produces in certain fields and the number that it requires to meet the needs of its growing economy would be to provide financial, or other, incentives to students and institutions. These incentives would be targeted toward increasing the number of graduates in areas where potential critical shortages are projected. Such incentives could include scholarships to students choosing careers

in critical shortage areas and/or programmatic funds to colleges and universities that respond quickly to develop programs in the shortage areas.

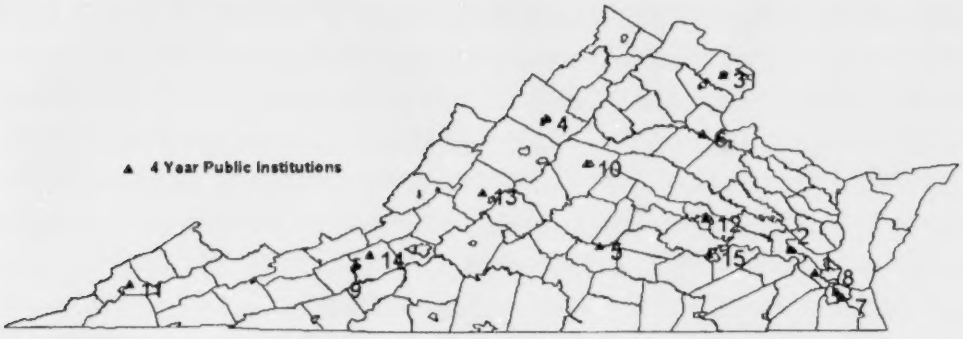
Next Steps

Now that the System-Wide Needs Assessment is complete, the Council must embark on a strategic planning effort that will identify goals and strategies for ensuring that the increased enrollment, underserved populations, and programmatic needs of the Commonwealth will be adequately addressed. The Commonwealth, with leadership and commitment from SCHEV, the Governor, the General Assembly, and the colleges and universities, will craft a system-wide strategic plan for higher education that will guide the institutions as they prepare to meet Virginia's current and projected education and workforce needs.

Appendices

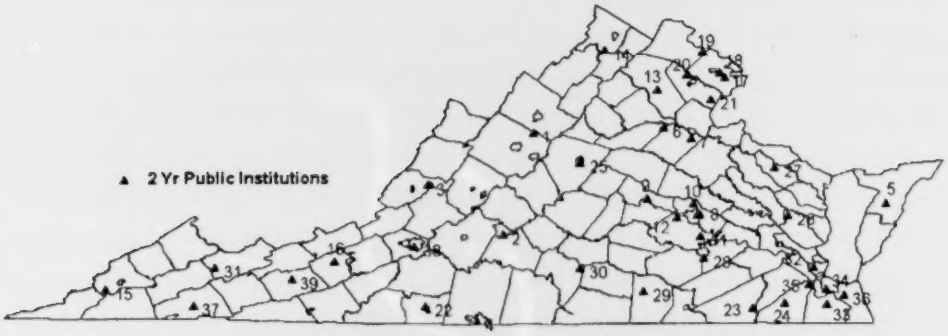
Appendix 2-A: Virginia Institutions of Higher Education

Public Four-Year Institutions



Number	Institution
1	Christopher Newport University
2	College of William and Mary
3	George Mason University
4	James Madison University
5	Longwood College
6	Mary Washington College
7	Norfolk State University
8	Old Dominion University
9	Radford University
10	University of Virginia
11	University of Virginia's College at Wise
12	Virginia Commonwealth University
13	Virginia Military Institute
14	Virginia Polytechnic Institute & State University
15	Virginia State University

Public Two-Year Institutions

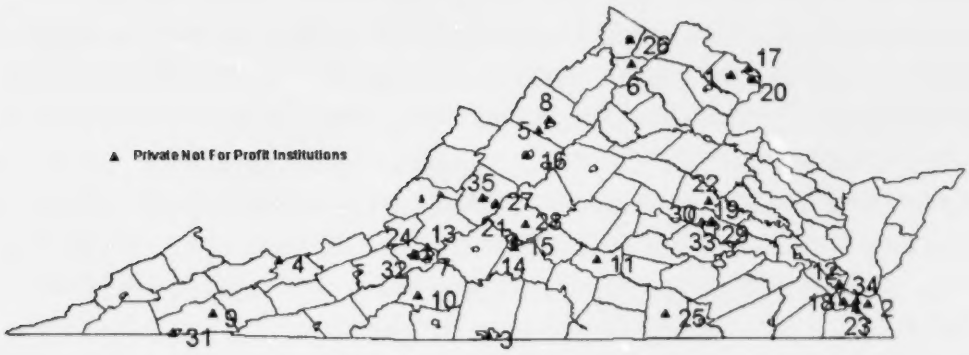


Number	Institution
1	Blue Ridge Community College
2	Central Virginia Community College
3	Dabney S. Lancaster Community College
4	Danville Community College
5	Eastern Shore Community College
6	Germanna Community College - Locust Grove Campus
7	Germanna Community College - Massaponax Campus
8	J. Sargeant Reynolds Community College - Downtown Campus
9	J. Sargeant Reynolds Community College - Goochland Campus
10	J. Sargeant Reynolds Community College - Henrico Campus
11	John Tyler Community College - Chester Campus
12	John Tyler Community College - Midlothian Campus
13	Lord Fairfax Community College - Fauquier County Campus
14	Lord Fairfax Community College - Middletown Campus
15	Mountain Empire Community College
16	New River Community College
17	Northern Virginia Community College - Alexandria Campus
18	Northern Virginia Community College - Annandale Campus
19	Northern Virginia Community College - Loudoun Campus
20	Northern Virginia Community College - Manassas Campus
21	Northern Virginia Community College - Woodbridge Campus
22	Patrick Henry Community College
23	Paul D. Camp Community College - Franklin Campus
24	Paul D. Camp Community College - Suffolk Campus
25	Piedmont Virginia Community College
26	Rappahannock Community College - Glenns Campus
27	Rappahannock Community College - Warsaw Campus

Public Two-Year Institutions (cont.)

Number	Institution
28	Richard Bland College
29	Southside Virginia Community College - Alberta Campus
30	Southside Virginia Community College - Keysville Campus
31	Southwest Virginia Community College
32	Thomas Nelson Community College
33	Tidewater Community College - Chesapeake Campus
34	Tidewater Community College - Norfolk Campus
35	Tidewater Community College - Portsmouth Campus
36	Tidewater Community College - Virginia Beach Campus
37	Virginia Highlands Community College
38	Virginia Western Community College
39	Wytheville Community College

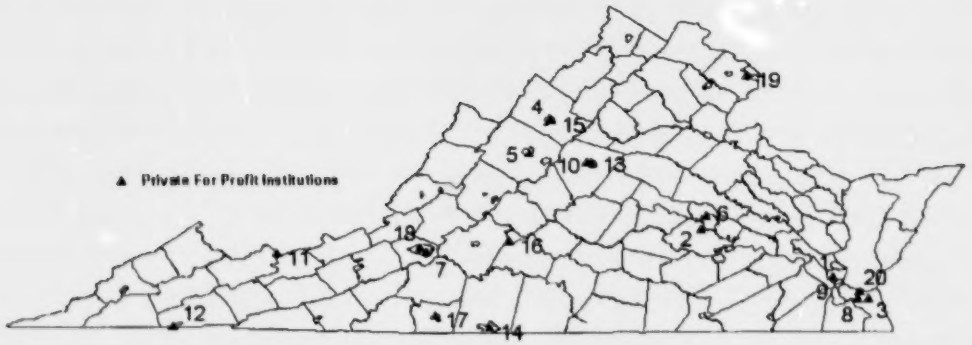
Private Non-Profit Institutions



Private Non-Profit Institutions (cont.)

Number	Institution
1	American Military Institute
2	Atlantic University
3	Averett College
4	Bluefield College
5	Bridgewater College
6	Christendom College
7	College of Health Sciences
8	Eastern Mennonite College
9	Emory and Henry College
10	Ferrum College
11	Hampden-Sydney College
12	Hampton University
13	Hollins College
14	Liberty University
15	Lynchburg College
16	Mary Baldwin College
17	Marymount University
18	Medical College of Hampton Roads, EVMS
19	Presbyterian School for Christian Education
20	Protestant Episcopal Seminary
21	Randolph-Macon Womens College
22	Randolph-Macon College
23	Regent University
24	Roanoke College
25	Saint Pauls College
26	Shenandoah University
27	Southern Virginia College
28	Sweet Briar College
29	Union Theological Seminary
30	University of Richmond
31	Virginia Intermont College
32	Virginia Seminary & College
33	Virginia Union University
34	Virginia Wesleyan College
35	Washington & Lee University

Private For-Profit Institutions



Number	Institution
1	Bryant & Stratton College - Hampton Campus
2	Bryant & Stratton College - Richmond Campus
3	Bryant & Stratton College - Virginia Beach Campus
4	Dominion Business School - Harrisonburg
5	Dominion Business School - Staunton
6	ECPI Computer Institute - Richmond Campus
7	ECPI Computer Institute - Roanoke Campus
8	ECPI College of Technology - Virginia Beach Campus
9	ECPI Computer Institute - Hampton Campus
10	Institute of Textile Technology
11	National Business College - Bluefield Campus
12	National Business College - Bristol Campus
13	National Business College - Charlottesville Campus
14	National Business College - Danville Campus
15	National Business College - Harrisonburg Campus
16	National Business College - Lynchburg Campus
17	National Business College - Martinsville Campus
18	National Business College - Roanoke Valley Campus
19	Notre Dame Graduate School of Christendom College
20	World College

Appendix 2-B: Fall 2000 Higher Education Enrollment Rates by Age and Race/Ethnicity

The tables below detail, by age cohort and racial/ethnic category, the proportion of Virginians who attended a Virginia institution of higher education in fall 1996 through fall 2000. These data are derived using SCHEV's comprehensive student enrollment database and U.S. Bureau of the Census, Series A, state population projections. It is important to keep in mind, however, that because these data do not take into account Virginians attending out-of-state institutions, and because a small proportion of the student records in SCHEV's enrollment database did not contain data on race or ethnicity, the enrollment rates presented below probably somewhat understate actual college attendance rates for most age cohort and racial/ethnic categories.

All Race/Ethnicity Categories:

Age	1996	1997	1998	1999	2000
15-24	16.9%	17.5%	17.8%	18.1%	18.5%
25-34	5.9%	5.9%	6.0%	6.0%	5.8%
35-44	3.2%	3.2%	3.1%	3.1%	2.9%
44 and older	1.1%	1.1%	1.1%	1.2%	1.1%

Asian

Age	1996	1997	1998	1999	2000
15-24	30.8%	30.0%	29.6%	29.0%	28.7%
25-34	9.1%	9.4%	9.4%	9.5%	9.3%
35-44	2.9%	3.1%	3.0%	3.0%	2.8%
45 and older	1.2%	1.2%	1.1%	1.1%	1.0%

Black

Age	1996	1997	1998	1999	2000
15-24	11.7%	11.9%	12.3%	12.6%	13.1%
25-34	4.8%	4.9%	5.1%	5.2%	5.2%
35-44	3.0%	3.1%	3.1%	3.2%	3.2%
45 and older	0.9%	1.0%	1.0%	1.1%	1.2%

Hispanic

Age	1996	1997	1998	1999	2000
15-24	10.9%	11.3%	11.6%	11.9%	12.1%
25-34	3.5%	3.5%	3.6%	3.9%	3.9%
35-44	2.1%	2.0%	2.0%	2.1%	1.9%
45 and older	0.9%	0.9%	0.9%	1.0%	0.9%

Native American

Age	1996	1997	1998	1999	2000
15-24	31.4%	33.8%	39.3%	38.1%	40.0%
25-34	9.5%	12.0%	14.2%	15.8%	15.7%
35-44	7.3%	7.5%	7.6%	8.4%	7.3%
45 and older	2.5%	2.6%	3.1%	3.3%	3.2%

White

Age	1996	1997	1998	1999	2000
15-24	18.2%	18.9%	19.3%	19.7%	19.9%
25-34	6.1%	6.2%	6.1%	6.1%	5.8%
35-44	3.4%	3.3%	3.2%	3.1%	2.8%
45 and older	1.1%	1.2%	1.2%	1.2%	1.1%

Appendix 2-C: Enrollment Demand Projection Methodology

Public Institution Enrollment Demand

Because SCHEV has more comprehensive and consistent data on enrollment in public institutions of higher education, we were able to use a detailed input/output model to project enrollment demand for Virginia's public four-year and public two-year colleges and universities over the period from 2001 to 2010. This model uses projections of the number of new students who are likely to enter each of these two sectors each year and the number of students who are likely to graduate or otherwise leave each sector each year to project likely future enrollment levels in each sector. SCHEV, in combination with Virginia's public institutions of higher education and the Department of Planning and Budget, has used a variant of this model for the last six years to meet its statutory responsibility to provide student enrollment projections. The model has performed quite successfully – exhibiting less than one percent system-wide forecast errors each year.

Mathematically the model can be depicted:

$$HCENR_{it} = HCENR_{it-1} + NEWSTD_{it} - GRAD/LEFT_{it-1}$$

Where: $HCENR_{it}$ = fall headcount enrollment by sector (i) in year (t)
$HCENR_{it-1}$ = fall headcount enrollment by sector (i) in the prior year (t-1)
$NEWSTD_{it}$ = new students by sector (i) in year (t)
$GRAD/LEFT_{it-1}$ = students who graduated or left by sector (i) in the prior year (t-1)

To derive a projection of the number of new students each year we use U.S. Bureau of the Census, Series A, state population projections to calculate annual growth rates for thirteen age groups (10 to 14, 15 to 19, 20 to 24, 25 to 29, 30 to 34, 35 to 39, 40 to 44, 45 to 49, 50 to 54, 55 to 59, 60 to 64, 65 to 69, and 70 and above) and five racial/ethnic categories (Asian and Pacific Islander, Black, Hispanic, Native American, and White). The reason we employ such a large number of age groups is that, as was shown in the *Where We Are Going – Projected Virginia Population – 2000 to 2010* section, the demographic trends and college participation rates exhibited by these groups are highly varied and, as a result, pooling them could result in misleading conclusions. We then apply these annual growth rates to the number of new students admitted in the prior year, disaggregated according to student level (*i.e.*, freshman, sophomore, junior, senior

and fifth year, unclassified undergraduate, first professional, first-year graduate, advanced graduate, and unclassified graduate) age group, and racial/ethnic group.

Mathematically:

$$NEWSTD_{ijkzt} = (NEWSTD_{ijkzt-1})(?_{jkt})$$

Where: $NEWSTD_{ijkzt}$ = new students by sector (i), age cohort (j), racial/ethnic group (k), and student level (z) in year (t)
$NEWSTD_{ijkzt-1}$ = new students by sector (i), age cohort (j), racial/ethnic group (k), and student level (z) in the prior year (t-1)
$?_{jkt}$ = the annual growth rate for individuals by age cohort (j), and racial/ethnic group (k) in year (t)

To derive a projection of the number of students who graduate or otherwise leave each year we take advantage of SCHEV's detailed student database to track aggregate progression and retention of students across the nine student levels detailed above. The progression and retention rates used for the projection are for fall 1999 to fall 2000, the most recently available data.

Mathematically:

$$GRAD/LEFT_{it-1} = HCENR_{it-1} - \sum STD_{izt-1}$$

Where: $GRAD/LEFT_{it-1}$ = students who graduated or left by sector (i) in the prior year (t-1)
$HCENR_{it-1}$ = fall headcount enrollment by sector (i) in the prior year (t-1)
STD_{izt-1} = students by sector (i) and student level (z) in the prior year (t-1) who either remained in level or progressed to another level in year (t)

Private Institution Enrollment Demand

To project future enrollment demand in the private non-profit and private for profit institutions we again use U.S. Bureau of the Census, Series A, state population projections to calculate annual growth rates for 13 age groups (10-14, 15-19, 20-24, 25-29, 30-34, 35-39, 40-44, 45-49, 50-54, 55-59, 60-64, 65-69, and 70 and above) and five racial/ethnic categories (Asian and Pacific Islander, Black, Hispanic, Native American, and White). In this case, however, we apply those annual growth rates to all students enrolled in the prior year by age and racial/ethnic group, rather than just new students. In this way, enrollment is determined directly as opposed to through an input/output model. This more

generalized approach is necessary because comprehensive student-specific data on year-to-year changes in new admissions is not available for all of these institutions. Although this more generalized approach cannot track the effect on overall enrollments of non-linear changes in the number of new students as accurately as the input/output model used for the public institutions, it has, nonetheless, been used elsewhere with good results.[72]

Mathematically:

$$HCENR_{ijkt} = (HCENR_{ijkt-1})(?_{jkt})$$

Where: $HCENR_{ijkt}$ = students by sector (i), age cohort (j), and racial/ethnic group (k) in year (t)
$HCENR_{ijkt-1}$ = students by sector (i), age cohort (j), and racial/ethnic group (k) in the prior year (t-1)
$?_{jkt}$ = the annual growth rate for indivi duals by age cohort (j), and racial/ethnic group (k) in year (t)

[72] *See* Carnevale, Anthony P., and Fry, Richard A., *Closing the Great Divide – Can We Achieve Equity When Generation Y Goes to College?*, Education Testing Service, 2000.

Appendix 3-A: Quantitative Enrollment Capacity Assessment Methodology

SCHEV based its quantitative assessment of enrollment capacity on a revised version of the *instructional and academic support space guideline* it has used since 1997 to prioritize proposed capital projects. The revised guideline more adequately controls for differences in mission across colleges and universities and, thereby, provides an assessment of enrollment capacity that better takes into account the broad diversity characteristic of Virginia's system of higher education.

To accomplish this task, SCHEV used data submitted by the public institutions as part of the 2002-2004 capital budget process to develop estimates of the "typical" amount of assignable square feet of instructional and academic support space per regular session FTE that institutions currently use to accommodate their enrollment. Separate estimates of assignable square feet per FTE were developed for the three distinct categories of space included within the instructional and academic support guideline – *classrooms and class labs, other instructional space, and academic support space*. These estimates were then combined and applied to the amount of instructional and academic support space reported by institutions for FY 2001 and FY 2006 to develop system-wide enrollment capacity estimates for those years.

Mathematically, this process can be represented as follows:

$$ECAP_j = \Sigma(S_{i,j}/(CCL_j + OI_j + AS_j))$$

Where:

$ECAP_j$ = enrollment capacity in sector (j), (*e.g.*, public four-year, public two-year, etc.),

$S_{i,j}$ = the amount of instructional and academic support space reported by institution (i) of sector (j),

CCL_j = the space need guideline for *classrooms and class labs* in sector (j),

OI_j = the space need guideline of *other instructional space* in sector (j), and

AS_j = the space need guideline for *academic support space* in sector (j).

We derived estimates of the "typical" amount of assignable square feet per FTE for *other instructional space* and *academic support space* by dividing the amount of space reported by each institution in each space category by that

institution's number of FTE and then calculating the median of those ratios by sector. We used medians to estimate "typical" space needs, in this case as well as all others, because medians are a more robust measure of central tendency in circumstances characterized by small sample sizes or non-normal distributions. The data used to develop these estimates exhibited both of these difficulties.

Mathematically:

$$OI_j = \text{MEDIAN}\ (S_{OI,i,j}/E_{i,j})$$

$$AS_j = \text{MEDIAN}\ (S_{AS,i,j}/E_{i,j})$$

Where:

$S_{OI,i,j}$ = *other instructional space* reported by institution (i) of sector (j),

$S_{AS,i,j}$ = *academic support space* reported by institution (i) of sector (j), and

$E_{i,j}$ = regular session FTE enrollment in institution (i) of sector (j).

However, because differences in institutional mission are more clearly reflected in different requirements for classroom and class lab space, we further disaggregated the *classroom and class lab* guideline to control for differences in the amount of space needed for classrooms and class labs individually, differences in the amount of space needed for specific academic disciplines, and differences in the amount of space needed for undergraduate instruction and graduate instruction.

Mathematically:

$$\begin{aligned} CCL_j = \ & \text{MEDIAN}\ (\Sigma((S_{C,U,y,i,j}/E_{U,y,i,j})(E_{U,y,i,j}/E_{i,j})) + \\ & \Sigma((S_{C,G,y,i,j}/E_{G,y,i,j})(E_{G,y,i,j}/E_{i,j})) + \\ & \Sigma((S_{CL,U,y,i,j}/E_{U,y,i,j})(E_{U,y,i,j}/E_{i,j})) + \\ & \Sigma((S_{CL,G,y,i,j}/E_{G,y,i,j})(E_{G,y,i,j}/E_{i,j}))) \end{aligned}$$

Where:

$S_{C,U,y,i,j}$ = *classroom space* (C) used for undergraduate instruction (U) in academic discipline (y) in institution (i) of sector (j),
$S_{C,G,y,i,j}$ = *classroom space* (C) used for graduate instruction (G) in academic discipline (y) in institution (i) of sector (j),
$S_{CL,U,y,i,j}$ = *class lab space* (CL) used for undergraduate instruction (U) in academic discipline (y) in institution (i) of sector (j),
$S_{CL,G,y,i,j}$ = *class lab space* (CL) used for graduate instruction (G) in academic discipline (y) in institution (i) of sector (j),

$E_{U,y,i,j}$ = undergraduate (U) regular session FTE enrollment in academic discipline (y) in institution (i) of sector (j),
$E_{G,y,i,j}$ = graduate (G) regular session FTE enrollment in academic discipline (y) in institution (i) of sector (j), and
$E_{i,j}$ = total regular session FTE enrollment in institution (i) of sector (j).

Finally, to take account of the fact that some institutions use their space more intensively than others we also adjusted the data to reflect the space that an institution would require if it were fully meeting SCHEV's utilization guidelines for classroom and class lab utilization. This adjustment was accomplished by: 1) multiplying the assignable square feet of classroom space each institution used per FTE by the institution's average weekly hours of classroom station use as a percentage of the SCHEV guideline, and 2) multiplying the assignable square feet of class lab space each institution used per FTE by the institution's average weekly hours of class lab station use as a percentage of the SCHEV guideline.

Mathematically:

$(S_{C,U,y,i,j}/E_{U,y,i,j})(U_{C,i,j}/24)$
$(S_{C,G,y,i,j}/E_{G,y,i,j})(U_{C,i,j}/24)$
$(S_{CL,U,y,i,j}/E_{U,y,i,j})(U_{CL,i,j}/18)$
$(S_{CL,G,y,i,j}/E_{G,y,i,j})(U_{CL,i,j}/18)$

Where:

$U_{C,i,j}$ = average weekly hours of classroom (C) station use for institution (i) of sector (j), and
$U_{CL,i,j}$ = average weekly hours of class lab (CL) station use for institution (i) of sector (j).

Appendix 3-B: Enrollment Capacity Assessment Supplemental Survey

Supplemental Enrollment Capacity Survey

As part of its System-Wide Needs Assessment initiative, SCHEV is producing an enrollment capacity estimate for your institution. This effort is meant to provide a general assessment of system-wide needs for planning purposes only.

Because SCHEV's enrollment capacity estimate is based exclusively on an empirical analysis of your institution's instructional and academic support space – the core space components used for delivery of instructional services – and does not take into account other potential binding constraints on growth, we ask you to provide additional information by answering the following questions. To the greatest extent possible, please provide empirical support for your answers (*e.g.*, dormitory capacity).

1. Is additional enrollment growth consistent with your institution's mission? What is your institution's optimal enrollment size, given current facilities and your mission, goals, and objectives? Based on planned additions to existing facilities and your mission, goals, and objectives, what do you anticipate your institution's optimal enrollment size will be in 2010? Please elaborate.

2. Does your institution face constraints on enrollment growth that are not accounted for in SCHEV's analysis of your instructional and academic support space? For example, what implications does growth have on: dormitory capacity, facilities that support student services, land, infrastructure, or operating support? Are there ways to remove these constraints? If so, what additional actions would be required?

3. Could your institution absorb a larger number of in-state students by decreasing the proportion of out-of-state students enrolled? What would be the fiscal impact? Assuming your institution was fully compensated for any adverse fiscal impact, what is the maximum proportion of in-state students that your institution would be able to enroll while still insuring diversity? Please elaborate as appropriate.

Appendix 3-C: 2000 Space Utilization Estimates

Public Four-Year Institutions

Institution	Weekly Hours of Classroom Station Use	As Percentage of Guideline	Weekly Hours of Class Lab Station Use	As Percentage of Guideline
Christopher Newport University	26	108%	13	72%
College of William and Mary	20	83%	16	89%
George Mason University	22	92%	18	100%
James Madison University	26	108%	20	111%
Longwood College	18	75%	10	56%
Mary Washington College	21	88%	10	56%
Norfolk State University	14	58%	11	61%
Old Dominion University	28	117%	22	122%
Radford University	29	121%	19	106%
University of Virginia	22	92%	11	61%
University of Virginia – Wise	16	67%	6	33%
Virginia Commonwealth University	24	100%	20	111%
Virginia State University	13	54%	7	39%
Virginia Polytechnic Institute	26	108%	16	89%
System-Wide	22	92%	15	83%

Community Colleges

Institution	Weekly Hours of Classroom Station Use	As Percentage of Guideline	Weekly Hours of Class Lab Station Use	As Percentage of Guideline
Blue Ridge	30	125%	29	161%
Central Va.	10	42%	19	106%
Dabney S. Lancaster	18	75%	19	106%
Danville	13	54%	27	150%
Eastern Shore	18	75%	11	61%
Germanna	34	142%	25	139%
J. Sargeant Reynolds	18	75%	23	128%
John Tyler	19	79%	22	122%
Lord Fairfax	37	154%	56	311%
Mountain Empire	19	79%	15	83%
New River	20	83%	17	94%
Northern Virginia	33	138%	21	117%
Patrick Henry	12	50%	21	117%
Paul D. Camp	16	67%	23	128%
Piedmont Va.	31	129%	28	156%
Rappahannock	9	38%	14	78%
Southside Va.	18	75%	18	100%
Southwest Va.	18	75%	23	128%
Thomas Nelson	34	142%	33	183%
Tidewater	29	121%	22	122%
Va. Highlands	16	67%	17	94%
Va. Western	28	117%	38	211%
Wytheville	16	67%	18	100%
System-Wide	25	104%	23	128%

Appendix 3-D: Enrollment Capacity Guideline for Instructional and Academic Support Space (assignable square feet per regular session FTE)

Public Four-Year Institutions

	Current Utilization	Guideline Utilization
Classrooms and Class Labs[73]	14.6	12.8
Other Instruction	31.3	31.3
Academic Support	2.6	2.6
TOTAL	**48.5**	**46.7**

Virginia Community College System

	Current Utilization	Guideline Utilization
Classrooms and Class Labs[74]	25.0	26.4
Other Instruction	14.2	14.2
Academic Support	2.5	2.5
TOTAL	**41.7**	**43.1**

[73] Average of the institution-specific classroom and class lab guidelines for the public four-year colleges and universities (excludes Virginia Military Institute).

[74] Average of the institution-specific classroom and class lab guidelines for the community colleges.

Appendix 3-E: Discipline-Specific Space Need Benchmarks for Classrooms and Class Labs (assignable square feet per regular session FTE)

Public Four-Year Institutions – Current Utilization

Classroom – Undergraduate

Academic Discipline	Standard	High FTE[75]	Low FTE[76]	Threshold FTE[77]
Agriculture		5.4	13.5	485
Architecture		2.5	8.9	540
Area Studies	8.1			
Biology	5.8			
Business/Management	7.6			
Communications		6.3	13.6	145
Computer/Info Serv.	7.0			
Education	8.5			
Engineering	8.5			
Fine/Applied Arts		3.6	8.9	491
Foreign Languages	11.2			
Health Professions	12.4			
Home Economics	12.1			
Law	15.0			
Letters	9.6			
Library Science	37.1			
Mathematics	9.7			
Military Sciences		17.7	26.8	19
Physical Sciences	6.6			
Psychology		5.8	8.1	347
Public Affairs		9.5	14.4	109
Social Sciences		7.9	10.4	1097
Interdisciplinary Studies	11.0			
Natural Science Tech.	1.4			

[75] If the data revealed economies of scale (*i.e.*, a statistical correlation between assignable square feet per FTE and number of FTE by discipline across institutions), this number is the space need benchmarks for institutions with a "high" number of FTE.

[76] If the data revealed economies of scale (*i.e.*, a statistical correlation between assignable square feet per FTE and number of FTE by discipline across institutions), this number is the space need benchmarks for institutions with a "low" number of FTE.

[77] This is the threshold used to distinguish between "high" and "low" FTE and reflects the median number of FTE in this academic discipline across institutions.

Public Four-Year Institutions – Current Utilization (cont.)

Class Lab – Undergraduate

Academic Discipline	Standard	High FTE	Low FTE	Threshold FTE
Agriculture		10.1	27.5	485
Architecture	22.0			
Biology	14.1			
Business/Management		0.4	0.9	424
Communications	3.5			
Computer/Info Serv.		3.6	7.1	225
Education	2.9			
Engineering	8.0			
Fine/Applied Arts	20.9			
Foreign Languages		0.3	1.9	268
Health Professions	7.9			
Home Economics		9.1	2.6	560
Letters	0.5	0.2	0.6	740
Mathematics	1.0			
Military Sciences		16.7	52.1	37
Physical Sciences		15.0	33.1	322
Psychology	1.2			
Public Affairs	0.1			
Social Sciences	0.6			
Interdisciplinary Studies	7.0			
Natural Science Tech.	25.3			

Public Four-Year Institutions – Current Utilization (cont.)

Classroom – Graduate

Academic Discipline	Standard	High FTE	Low FTE	Threshold FTE
Agriculture	3.6			
Architecture		13.6	0.2	241
Area Studies	4.2			
Biology		1.9	10.7	91
Business/Management	8.7			
Communications		12.0	36.5	14
Computer/Info Serv.		6.1	19.3	79
Education		7.4	16.3	185
Engineering		6.5	8.8	525
Fine/Applied Arts	6.2			
Foreign Languages		8.8	10.8	88
Health Professions		9.7	23.8	118
Home Economics	8.2			
Law	21.9			
Letters	12.7			
Library Science	27.5			
Mathematics	12.3			
Physical Sciences	14.9			
Psychology	8.7			
Public Affairs	13.1			
Social Sciences	20.0			
Interdisciplinary Studies	9.6			

Class Lab – Graduate

Academic Discipline	Standard	High FTE	Low FTE	Threshold FTE
Agriculture	7.0			
Architecture		16.4	29.0	241
Biology		8.0	52.5	64
Business/Management	3.5			
Computer/Info Serv.		2.4	0.5	111
Education	3.0			
Engineering		2.0	49.5	525
Fine/Applied Arts	30.8			
Foreign Languages	12.0			
Home Economics	3.3			
Law		4.9	1.1	820
Letters		0.3	8.0	104
Mathematics		3.5	5.8	55
Physical Sciences	60.7			
Psychology		2.6	4.0	111
Public Affairs	0.7			
Social Sciences		3.6	10.2	115
Interdisciplinary Studies	5.6			
Business Tech.	17.3			

Public Four-Year Institutions – Guideline Utilization

Classroom – Undergraduate

Academic Discipline	Standard	High FTE	Low FTE	Threshold FTE
Agriculture		5.9	7.3	485
Architecture		2.7	8.2	540
Area Studies		6.7	7.4	11
Biology	5.1			
Business/Management	6.8			
Communications		6.2	13.0	145
Computer/Info Serv.	6.9			
Education	7.1			
Engineering	9.2			
Fine/Applied Arts		3.9	8.0	491
Foreign Languages	10.3			
Health Professions	10.7			
Home Economics		9.9	20.2	109
Law	16.3			
Letters	9.7			
Library Science	24.7			
Mathematics	8.5			
Military Sciences		12.9	21.9	19
Physical Sciences	5.9			
Psychology	6.7			
Public Affairs		10.3	12.2	109
Social Sciences	8.1			
Interdisciplinary Studies	10.0			
Natural Science Tech.	1.5			

Class Lab – Undergraduate

Academic Discipline	Standard	High FTE	Low FTE	Threshold FTE
Agriculture		9.0	10.7	485
Architecture	19.6			
Biology	8.7			
Business/Management	0.5			
Communications	3.1			
Computer/Info Serv.		3.6	6.8	225
Education	2.4			
Engineering	7.5			
Fine/Applied Arts	16.4			
Foreign Languages		0.3	1.1	268
Health Professions	6.2			
Home Economics		8.1	2.7	560
Letters		0.2	0.4	740
Mathematics		1.0	0.5	376
Military Sciences	14.8			
Physical Sciences	20.7			
Psychology	0.7			
Public Affairs	0.1			
Social Sciences	0.6			
Interdisciplinary Studies	7.4			
Natural Science Tech.	22.5			

Public Four-Year Institutions – Guideline Utilization (cont.)

Classroom – Graduate

Academic Discipline	Standard	High FTE	Low FTE	Threshold FTE
Agriculture	3.9			
Architecture		12.5	0.2	241
Area Studies	3.5			
Biology	4.5			
Business/Management	7.9			
Communications		11.0	40.9	14
Computer/Info Serv.		6.6	18.3	79
Education		7.2	13.5	185
Engineering	7.0			
Fine/Applied Arts	6.0			
Foreign Languages		8.1	9.9	88
Health Professions		8.8	27.1	118
Home Economics	8.9			
Law	20.1			
Letters	13.8			
Library Science	20.6			
Mathematics	13.3			
Physical Sciences	12.4			
Psychology	7.5			
Public Affairs	14.2			
Social Sciences	17.9			
Interdisciplinary Studies	9.8			

Class Lab – Graduate

Academic Discipline	Standard	High FTE	Low FTE	Threshold FTE
Agriculture	6.2			
Architecture		10.0	25.8	241
Biology		7.1	37.9	64
Business/Management	3.7			
Computer/Info Serv.		2.4	0.4	111
Education	2.3			
Engineering		1.8	35.8	525
Fine/Applied Arts	24.7			
Foreign Languages	10.7			
Home Economics	2.9			
Law		3.0	1.1	820
Letters		0.3	7.1	104
Mathematics		2.1	5.8	55
Physical Sciences	33.7			
Psychology		2.0	3.9	111
Public Affairs	0.7			
Social Sciences	5.1			
Interdisciplinary Studies	5.6			
Business Tech.	17.3			

Community Colleges – Current Utilization

Classroom

Academic Discipline	Standard	High FTE	Low FTE	Threshold FTE
Biology	6.5			
Computer/Info. Serv.	7.7			
Education	18.3			
Fine/Applied Arts	7.0			
Foreign Languages	14.3			
Letters	11.0			
Mathematics	11.2			
Physical Sciences	7.5			
Psychology	9.4			
Social Sciences	9.4			
Interdisciplinary Studies	16.2			
Business Tech.	8.9			
Data Processing Tech.	5.2			
Health Services Tech.	10.2			
Mechanical Tech.	5.0			
Natural Science Tech.	8.9			
Public Service Tech.	13.1			

Community Colleges – Current Utilization (cont.)

Class Lab

Academic Discipline	Standard	High FTE	Low FTE	Threshold FTE
Biology	24.9			
Computer/Info. Serv.	5.8			
Education	26.4			
Fine/Applied Arts	29.2			
Foreign Languages	7.4			
Letters	3.3			
Mathematics	2.5			
Physical Sciences		36.3	69.5	37
Psychology	1.6	0.3	4.3	102
Social Sciences	1.8			
Interdisciplinary Studies	5.3			
Business Tech.	11.2			
Data Processing Tech.		10.6	23.5	122
Health Services Tech.	16.0			
Mechanical Tech.		78.9	96.3	97
Natural Science Tech.	23.0			
Public Service Tech.	8.0			

Community Colleges – Guideline Utilization

Classroom

Academic Discipline	Standard	High FTE	Low FTE	Threshold FTE
Biology	6.1			
Computer/Info. Serv.	7.3			
Education	17.7			
Fine/Applied Arts	7.8			
Foreign Languages	18.0			
Letters	9.5			
Mathematics	8.9			
Physical Sciences	7.0			
Psychology	8.1			
Social Sciences	8.6			
Interdisciplinary Studies	11.9			
Business Tech.	8.1			
Data Processing Tech.	4.2			
Health Services Tech.	9.3			
Mechanical Tech.	3.3			
Natural Science Tech.	6.7			
Public Service Tech.	14.3			

Community Colleges – Guideline Utilization (cont.)

Class Lab

Academic Discipline	Standard	High FTE	Low FTE	Threshold FTE
Biology	31.3			
Computer/Info. Serv.	9.2			
Education	33.7			
Fine/Applied Arts	40.3			
Foreign Languages	10.3			
Letters	3.7			
Mathematics	2.6			
Physical Sciences		49.6	67.8	37
Psychology		0.3	5.1	102
Social Sciences	2.3			
Interdisciplinary Studies	5.8			
Business Tech.	13.6			
Data Processing Tech.		14.9	23.5	122
Health Services Tech.	18.7			
Mechanical Tech.		88.9	107.0	97
Natural Science Tech.	25.9			
Public Service Tech.	8.4			

Appendix 4-A: Virginia Localities that are not within a 30-minute Drive of either a Public or Private Four-Year College or University.

Locality	Enrollment Rate in Four-Year Colleges and Universities			
	15 to 19 yr. olds	20 to 24 yr. olds	25 to 34 yr. olds	35 to 44 yr. olds
Accomack	4.8%	7.9%	1.1%	0.7%
Alleghany	5.1%	11.6%	1.3%	0.3%
Bath	8.3%	21.1%	2.3%	0.4%
Bland	6.5%	12.5%	0.9%	0.4%
Buchanan	5.2%	9.3%	1.0%	0.5%
Carroll	4.4%	5.6%	0.9%	0.4%
Culpeper	5.2%	11.3%	1.1%	0.7%
Dickenson	5.3%	8.7%	1.2%	0.8%
Essex	12.1%	14.8%	2.2%	1.2%
Floyd	6.7%	11.6%	1.6%	1.0%
Grayson	6.0%	6.2%	0.6%	0.7%
Halifax	7.8%	13.0%	1.4%	0.7%
Highland	7.4%	26.8%	0.5%	0.2%
King and Queen	5.9%	11.2%	1.4%	0.3%
Lancaster	8.9%	25.3%	2.3%	0.6%
Lee	3.0%	5.9%	0.5%	0.2%
Louisa	6.6%	12.3%	1.9%	0.9%
Madison	7.6%	14.9%	1.7%	0.8%
Mathews	12.7%	23.1%	2.6%	0.9%
Mecklenburg	6.9%	10.3%	1.5%	0.7%
Middlesex	9.1%	21.0%	1.8%	1.0%
Northampton	8.7%	16.3%	1.1%	0.6%
Northumberland	6.7%	15.0%	1.5%	0.5%
Orange	7.9%	11.9%	1.9%	1.4%
Patrick	5.0%	8.2%	1.0%	0.5%
Richmond	16.8%	20.7%	5.4%	0.9%
Scott	5.6%	7.3%	0.5%	0.1%
Southampton	7.2%	8.6%	1.0%	0.6%
Surry	10.0%	19.5%	1.6%	0.5%
Westmoreland	6.4%	12.0%	1.9%	0.9%
Wythe	6.1%	9.8%	1.8%	0.6%
Clifton Forge	5.7%	13.8%	2.7%	2.0%
Covington	13.1%	14.1%	2.3%	2.4%
Galax	9.6%	10.1%	1.4%	0.5%
Median	**6.7%**	**12.0%**	**1.5%**	**0.7%**

Appendix 5-A: Top 100 Growth Occupations – Percentage Change 1998 to 2008[78]

OES	Occupation	Employment		Change		Average Annual Openings		
Code	Title	Estimated 1998	Projected 2008	Absolute	Percentage	Replacement	Growth	Total
22127	Computer Engineers	14,265	34,792	20,527	143.90%	89	2,053	2,142
25104	Computer Support Specialists	15,019	35,929	20,910	139.22%	93	2,091	2,184
25103	Database Administrators	3,095	7,107	4,012	129.63%	50	401	451
25199	Computer Scientists, NEC	3,224	7,171	3,947	122.43%	20	395	415
25102	Systems Analysts	26,452	55,601	29,149	110.20%	164	2,915	3,079
32199	Health Practitioners, NEC	122	241	119	97.54%	3	12	15
32113	Chiropractors	211	376	165	78.20%	4	17	21
89707	Desktop Publishing Spe cialists	598	1,060	462	77.26%	10	46	56
66011	Home Health Aides	11,505	20,159	8,654	75.22%	160	865	1,025
31226	Computer Science Teachers, Pstscndry	710	1,218	508	71.55%	20	51	71
31317	Instructors, Adult (Non-VocEd)	1,740	2,952	1,212	69.66%	18	121	139
31258	Parks/Rec/Leisure/Fitns Stds Teachers	165	279	114	69.09%	5	11	16
68035	Personal & Home Care Aides	3,342	5,628	2,286	68.40%	87	229	316
32511	Physician Assistants	1,318	2,201	883	67.00%	22	88	110
34005	Technical Writers	2,021	3,344	1,323	65.46%	53	132	185
66005	Medical Assistants	5,753	9,502	3,749	65.17%	142	375	517
93951	Engraving & Printing Wkrs, Hand	420	688	268	63.81%	10	27	37
31212	Health Specialties Teachers, Pstscndry	397	650	253	63.73%	11	25	36
66021	Occupational Therapy Assistants	511	835	324	63.41%	13	32	45
43099	Sales Reps, Services, NEC	4,521	7,339	2,818	62.33%	167	282	449
31211	Health Diagnostics Teachers, Pstscndry	2,009	3,260	1,251	62.27%	56	125	181
49026	Telemarketers, Door-To-Door Sales	13,056	21,104	8,048	61.64%	336	805	1,141
27307	Residential Counselors	3,155	5,072	1,917	60.76%	72	192	264
28305	Paralegals & Legal Assistants	3,656	5,865	2,209	60.42%	31	221	252
32314	Speech Pathologists, Audiologists	2,106	3,334	1,228	58.31%	32	123	155
66017	Physical, Corrective Therapy Assistants	1,707	2,701	994	58.23%	42	99	141

[78] Data Provided by the Virginia Employment Commission.

Appendix 5-A: Top 100 Growth Occupations – Percentage Change 1998 to 2008 (cont.)

OES	Occupation	Employment		Change		Average Annual Openings		
Code	Title	Estimated 1998	Projected 2008	Absolute	Percentage	Replacement	Growth	Total
68038	Child Care Workers	8,823	13,879	5,056	57.30%	87	506	593
31213	Communications Teachers, Pstscndry	192	301	109	56.77%	5	11	16
53508	Bill & Account Collectors	6,286	9,767	3,481	55.38%	166	348	514
25105	Computer Programmers	25,353	39,137	13,784	54.37%	786	1,378	2,164
31303	Teachers, Preschool, Educ Srvcs	8,161	12,549	4,388	53.77%	174	439	613
13017	Engineering/Math/Computer/Ntrl Sci Mgrs	11,385	17,419	6,034	53.00%	199	603	802
43017	Sales Agents, Business	8,896	13,536	4,640	52.16%	183	464	647
66002	Dental Assistants	5,684	8,549	2,865	50.40%	87	287	374
32908	Dental Hygienists	3,086	4,621	1,535	49.74%	69	154	223
31202	Life Sciences Teachers, Postsecondary	662	988	326	49.24%	18	33	51
32308	Physical Therapists	2,625	3,914	1,289	49.10%	39	129	168
53123	Adjustment Clerks	14,105	21,003	6,898	48.90%	92	690	782
27505	Directors, Religious Activities/Education	310	461	151	48.71%	5	15	20
32911	Medical Records & Health Info Techns	1,401	2,083	682	48.68%	35	68	103
25315	Financial Analysts, Statistical	856	1,268	412	48.13%	13	41	54
68032	Wardrobe & Dressing Room Attendants	158	234	76	48.10%	4	8	12
68014	Amusement & Recreation Attendants	5,059	7,472	2,413	47.70%	93	241	334
32925	Cardiology Technols/Techns	695	1,022	327	47.05%	17	33	50
92902	Electronic Semiconductor Processors	992	1,458	466	46.98%	15	47	62
24111	Geologists, Geophysicists, Oceanogrphrs	1,218	1,789	571	46.88%	31	57	88
31521	Teacher Aides, Paraprofessional	12,905	18,927	6,022	46.66%	148	602	750
31311	Teachers, Special Education	8,402	12,306	3,904	46.47%	71	390	461
31244	Law Teachers, Postsecondary	368	537	169	45.92%	10	17	27
31517	Instructional Coordinators	3,445	5,027	1,582	45.92%	36	158	194
32302	Respiratory Therapists	1,663	2,424	761	45.76%	25	76	101
32999	Health Prof, Paraprof, & Techns, NEC	12,052	17,543	5,491	45.56%	298	549	847
93917	Solderers & Brazers	982	1,426	444	45.21%	23	44	67

Appendix 5-A: Top 100 Growth Occupations – Percentage Change 1998 to 2008 (cont.)

OES	Occupation	Employment		Change		Average Annual Openings		
Code	Title	Estimated 1998	Projected 2008	Absolute	Percentage	Replacement	Growth	Total
68026	Flight Attendants	2,573	3,735	1,162	45.16%	55	116	171
34041	Interior Designers	977	1,418	441	45.14%	14	44	58
53905	Teacher Aides & Educational Assts	8,482	12,306	3,824	45.08%	97	382	479
43014	Securities/Commodities/Financial Svcs, Sls	4,395	6,371	1,976	44.96%	33	198	231
32305	Occupational Therapists	1,526	2,209	683	44.76%	23	68	91
32399	Therapists, NEC	573	829	256	44.68%	9	26	35
53505	Investigators, Clerical	233	337	104	44.64%	2	10	12
66023	Ambulance Drivers & Attendants, Ex EMT	867	1,254	387	44.64%	20	39	59
27308	Social/Human Service Assistants	6,516	9,371	2,855	43.82%	170	286	456
32928	Surgical Technologists	860	1,236	376	43.72%	21	38	59
34058	Athletes, Coaches, Umpires	940	1,342	402	42.77%	33	40	73
31218	Art, Drama & Music Teachers, Pstscndry	1,006	1,436	430	42.74%	28	43	71
27302	Social Workers, Med & Psych	5,699	8,106	2,407	42.24%	74	241	315
15032	Lawn Service Managers	500	710	210	42.00%	4	21	25
63017	Correctional Officers	10,772	15,225	4,453	41.34%	295	445	740
27305	Social Workers, Ex Med, Psych	9,045	12,780	3,735	41.29%	117	374	491
85705	Data Processing Equipment Repairers	1,705	2,408	703	41.23%	24	70	94
15008	Medical & Health Service Mgrs	3,628	5,114	1,486	40.96%	64	149	213
63032	Sheriffs & Deputy Sheriffs	2,802	3,949	1,147	40.94%	26	115	141
31242	Business Teachers, Postsecondary	1,528	2,152	624	40.84%	42	62	104
49034	Demonstrators/Product Promoters	1,219	1,715	496	40.69%	33	50	83
22502	Civil Engineering Techns/Technols	2,252	3,166	914	40.59%	58	91	149
34056	Producers, Directors, Actors	1,936	2,716	780	40.29%	43	78	121
25108	Computer Programmer Aides	3,302	4,629	1,327	40.19%	102	133	235
31321	Instructors & Coaches, Sports	8,552	11,954	3,402	39.78%	90	340	430
31314	Teachers & Instructors, VocED	5,202	7,254	2,052	39.45%	55	205	260
32102	Physicians	11,509	16,032	4,523	39.30%	180	452	632
22521	Surveying & Mapping Techns	2,548	3,546	998	39.17%	58	100	158

Appendix 5-A: Top 100 Growth Occupations – Percentage Change 1998 to 2008 (cont.)

OES	Occupation	Employment		Change		Average Annual Openings		
Code	Title	Estimated 1998	Projected 2008	Absolute	Percentage	Replacement	Growth	Total
31246	Criminal Justice/Law Enfrcmnt Tchrs, Pstsc	154	214	60	38.96%	4	6	10
66008	Nursing Aides & Orderlies	27,770	38,588	10,818	38.96%	387	1,082	1,469
21905	Management Analysts	10,902	15,138	4,236	38.86%	86	424	510
68021	Ushers, Lobby Attendants, & Ticket Tkrs	2,246	3,114	868	38.65%	41	87	128
98902	Hand Packers & Packagers	25,728	35,651	9,923	38.57%	636	992	1,628
31214	English Lang/Lit Teachers, Pstscndry	1,283	1,775	492	38.35%	36	49	85
34047	Music Directors, Singers & Related Wkrs	394	545	151	38.32%	8	15	23
31204	Chemistry Teachers, Postsecondary	327	452	125	38.23%	9	13	22
31223	Architecture Teachers, Postsecondary	152	210	58	38.16%	4	6	10
31233	Economics Teachers, Postsecondary	341	471	130	38.12%	9	13	22
31215	Foreign Lang/Lit Teachers, Pstscndry	546	754	208	38.10%	15	21	36
31236	Political Science Teachers, Postsecondary	344	475	131	38.08%	10	13	23
31222	Engineering Teachers, Postsecondary	720	994	274	38.06%	20	27	47
31224	Math & Science Teachers, Pstscndry	1,001	1,382	381	38.06%	28	38	66
31252	Education Teachers, Postsecondary	697	962	265	38.02%	19	27	46
31239	Social Sciences, Teachers, Pstscndry, NEC	250	345	95	38.00%	7	10	17
31235	History Teachers, Postsecondary	619	854	235	37.96%	17	24	41
31254	Philosphy/Religion Teachers, Pstscndry	353	487	134	37.96%	10	13	23
31206	Physics Teachers, Postsecondary	224	309	85	37.95%	6	9	15

Appendix 5-B: Top 100 Growth Occupations – Average Annual Openings 1998 to 2008[79]

OES	Occupation	Employment		Change		Average Annual Openings		
Code	Title	Estimated 1998	Projected 2008	Absolute	Percentage	Replacement	Growth	Total
49023	Cashiers	90,673	112,125	21,452	23.66%	3,951	2,145	6,096
49011	Salespersons, Retail	112,495	135,207	22,712	20.19%	3,813	2,271	6,084
19005	General Managers & Top Executives	92,181	114,764	22,583	24.50%	1,615	2,258	3,873
55347	General Office Clerks	76,653	93,671	17,018	22.20%	2,123	1,702	3,825
65008	Waiters & Waitresses	49,047	59,852	10,805	22.03%	2,702	1,081	3,783
25102	Systems Analysts	26,452	55,601	29,149	110.20%	164	2,915	3,079
65041	Combined Food Prep & Serv Workers	36,451	43,058	6,607	18.13%	2,008	661	2,669
98999	Helpers, Laborers & Movers, NEC	50,010	58,543	8,533	17.06%	1,548	853	2,401
31308	Teachers, Secondary School	33,176	44,562	11,386	34.32%	1,059	1,139	2,198
25104	Computer Support Specialists	15,019	35,929	20,910	139.22%	93	2,091	2,184
25105	Computer Programmers	25,353	39,137	13,784	54.37%	786	1,378	2,164
51000	Administrative Support Supervisors	41,579	53,855	12,276	29.52%	936	1,228	2,164
22127	Computer Engineers	14,265	34,792	20,527	143.90%	89	2,053	2,142
67005	Janitors & Cleaners	53,246	62,998	9,752	18.31%	1,156	975	2,131
65038	Food Preparation Workers	27,423	32,205	4,782	17.44%	1,511	478	1,989
32502	Registered Nurses	45,568	57,867	12,299	26.99%	752	1,230	1,982
55305	Receptionists & Information Clerks	35,209	48,089	12,880	36.58%	674	1,288	1,962
31305	Teachers, Elementary	36,538	44,686	8,148	22.30%	844	815	1,659
98902	Hand Packers & Packagers	25,728	35,651	9,923	38.57%	636	992	1,628
39999	Prof, Paraprof, Techns, NEC	33,396	41,539	8,143	24.38%	807	814	1,621
41000	Marketing & Sales Supervisors	42,785	53,262	10,477	24.49%	559	1,048	1,607
55108	Secretaries, Except Legal or Medical	65,024	69,593	4,569	7.03%	1,061	457	1,518
63047	Guards	23,782	32,558	8,776	36.90%	593	878	1,471
66008	Nursing Aides & Orderlies	27,770	38,588	10,818	38.96%	387	1,082	1,469
97105	Truck Drivers, Light	32,484	41,611	9,127	28.10%	466	913	1,379
79041	Laborers, Landscapers, & Groundskprs	23,144	29,296	6,152	26.58%	690	615	1,305

[79] Data Provided by the Virginia Employment Commission.

Appendix 5-B: Top 100 Growth Occupations – Average Annual Openings 1998 to 2008 (cont.)

OES	Occupation	Employment		Change		Average Annual Openings		
Code	Title	Estimated 1998	Projected 2008	Absolute	Percentage	Replacement	Growth	Total
49026	Telemarketers, Door-To-Door Sales	13,056	21,104	8,048	61.64%	336	805	1,141
97102	Truck Drivers, Heavy	37,529	43,515	5,986	15.95%	539	599	1,138
19999	Managers & Administrators, NEC	31,753	37,323	5,570	17.54%	559	557	1,116
67002	Maids & Housekeeping Cleaners	26,674	32,088	5,414	20.30%	496	541	1,037
65032	Cooks, Fast Food	20,202	25,289	5,087	25.18%	528	509	1,037
66011	Home Health Aides	11,505	20,159	8,654	75.22%	160	865	1,025
21999	Management Support Workers, NEC	22,285	27,934	5,649	25.35%	422	565	987
65026	Cooks, Restaurant	18,932	23,752	4,820	25.46%	495	482	977
55338	Bookkeeping, Accounting, Audit Clerks	41,894	43,825	1,931	4.61%	782	193	975
85132	Maintenance Repairers, General Utility	28,062	31,332	3,270	11.65%	628	327	955
21114	Accountants & Auditors	22,847	28,437	5,590	24.47%	353	559	912
32505	Licensed Practical/Vocational Nurses	17,883	23,004	5,121	28.64%	383	512	895
61099	Service Supervisors, NEC	16,604	21,520	4,916	29.61%	379	492	871
49017	Counter & Rental Clerks	12,330	15,552	3,222	26.13%	534	322	856
32999	Health Prof, Paraprof, & Techns, NEC	12,052	17,543	5,491	45.56%	298	549	847
49008	Sales Representatives, Mfg & Wholesale	24,457	26,883	2,426	9.92%	597	243	840
13017	Engineering/Math/Computer/Ntrl Sci Mgrs	11,385	17,419	6,034	53.00%	199	603	802
53123	Adjustment Clerks	14,105	21,003	6,898	48.90%	92	690	782
85302	Automotive Mechanics	17,742	21,041	3,299	18.59%	441	330	771
98799	Freight, Stock & Mtrl Mvrs, Hand, NEC	17,410	18,584	1,174	6.74%	638	117	755
31521	Teacher Aides, Paraprofessional	12,905	18,927	6,022	46.66%	148	602	750
63017	Correctional Officers	10,772	15,225	4,453	41.34%	295	445	740
59000	Clerical Occupations, NEC	19,695	23,775	4,080	20.72%	317	408	725
22199	Engineers, NEC	13,868	17,054	3,186	22.97%	394	319	713
87102	Carpenters	19,302	21,211	1,909	9.89%	517	191	708
93956	Assemblers & Fabricators, NEC	23,294	26,049	2,755	11.83%	416	276	692
53102	Bank Tellers	15,929	15,553	-376	-2.36%	684	-38	684

Appendix 5-B: Top 100 Growth Occupations – Average Annual Openings 1998 to 2008 (cont.)

OES	Occupation	Employment		Change		Average Annual Openings		
Code	Title	Estimated 1998	Projected 2008	Absolute	Percentage	Replacement	Growth	Total
13011	Marketing, Advertising, Public Rltns Mgrs	12,646	17,408	4,762	37.66%	176	476	652
43017	Sales Agents, Business	8,896	13,536	4,640	52.16%	183	464	647
13002	Financial Managers	16,981	20,628	3,647	21.48%	269	365	634
32102	Physicians	11,509	16,032	4,523	39.30%	180	452	632
31303	Teachers, Preschool, Educ Srvcs	8,161	12,549	4,388	53.77%	174	439	613
49999	Sales & Related Workers, NEC	11,249	13,905	2,656	23.61%	347	266	613
93999	Hand Workers, NEC	10,540	13,640	3,100	29.41%	284	310	594
68038	Child Care Workers	8,823	13,879	5,056	57.30%	87	506	593
87200	Electrical Workers	17,129	19,490	2,361	13.78%	351	236	587
22126	Electrical & Electronics Engineers	10,416	14,029	3,613	34.69%	222	361	583
21511	Human Res, Training, Labor Rltns Specs	11,339	14,035	2,696	23.78%	302	270	572
97111	Bus Drivers, School	13,587	16,732	3,145	23.15%	243	315	558
81002	First Line Supervisors: Mechanics & Rprs	12,519	14,142	1,623	12.96%	371	162	533
63099	Protective Service Workers, NEC	5,514	7,088	1,574	28.55%	376	157	533
31399	Teachers & Instructors, NEC	15,870	19,385	3,515	22.15%	167	352	519
66005	Medical Assistants	5,753	9,502	3,749	65.17%	142	375	517
58023	Stock Clerks:Stockroom/Warehouse/Yard	18,841	21,166	2,325	12.34%	284	233	517
65017	Counter Attendants, Lunchroom	4,998	5,995	997	19.95%	415	100	515
53508	Bill & Account Collectors	6,286	9,767	3,481	55.38%	166	348	514
63014	Police Patrol Officers	8,306	11,236	2,930	35.28%	221	293	514
21905	Management Analysts	10,902	15,138	4,236	38.86%	86	424	510
49005	Sales Representatives, Science	10,977	13,400	2,423	22.07%	268	242	510
81005	First Line Supervisors: Constrctn, Extrctn	12,509	14,239	1,730	13.83%	333	173	506
79999	Agriculture, Forestry, Fishing Wkrs, NEC	16,380	15,263	-1,117	-6.82%	504	-112	504
15005	Education Administrators	9,300	11,966	2,666	28.67%	233	267	500
49021	Stock Clerks, Sales Floor	26,390	27,353	963	3.65%	398	96	494
27305	Social Workers, Ex Med, Psych	9,045	12,780	3,735	41.29%	117	374	491
58028	Traffic, Shipping & Receiving Clerks	20,294	21,759	1,465	7.22%	338	147	485

Appendix 5-B: Top 100 Growth Occupations – Average Annual Openings 1998 to 2008 (cont.)

OES	Occupation	Employment		Change		Average Annual Openings		
Code	Title	Estimated 1998	Projected 2008	Absolute	Percentage	Replacement	Growth	Total
13014	Administrative Services Mgrs	9,065	12,296	3,231	35.64%	159	323	482
53905	Teacher Aides & Educational Assts	8,482	12,306	3,824	45.08%	97	382	479
31311	Teachers, Special Education	8,402	12,306	3,904	46.47%	71	390	461
27308	Social/Human Service Assistants	6,516	9,371	2,855	43.82%	170	286	456
79021	Farm Equipment Operators	14,687	13,068	-1,619	-11.02%	452	-162	452
25103	Database Administrators	3,095	7,107	4,012	129.63%	50	401	451
74000	Farm Occupations	14,654	12,250	-2,404	-16.41%	451	-240	451
43099	Sales Reps, Services, NEC	4,521	7,339	2,818	62.33%	167	282	449
56017	Data Entry Keyers, Ex Composing	11,248	14,818	3,570	31.74%	86	357	443
15026	Food Service & Lodging Mgrs	10,524	13,058	2,534	24.08%	184	253	437
31321	Instructors & Coaches, Sports	8,552	11,954	3,402	39.78%	90	340	430
28108	Lawyers	10,559	13,703	3,144	29.78%	116	314	430
65014	Dining Room & Cafeteria Helpers	9,522	10,813	1,291	13.56%	290	129	419
25199	Computer Scientists, NEC	3,224	7,171	3,947	122.43%	20	395	415
68005	Hairdressers & Hairstylists	11,004	12,250	1,246	11.32%	283	125	408
65099	Food Prep & Service Workers, NEC	8,008	8,955	947	11.83%	308	95	403
21108	Loan Officers & Counselors	6,818	9,253	2,435	35.71%	150	244	394
21199	Financial Specialists, NEC	8,221	10,361	2,140	26.03%	180	214	394
22505	Electrical & Electronic Techns/Technols	8,559	10,695	2,136	24.96%	175	214	389

Appendix 5-C: 2000-01 Virginia College Graduates – Top 100 Academic Programs[80]

Program Title	Associate	Bachelors	Masters	Doctoral	1st Professional	Total
Business Administration and Management, General	804	2,283	1,568	5		4,660
Psychology, General		2,261	187	64		2,512
Nursing (RN Training)	899	880	195	13		1,987
Liberal Arts & Sciences, Gen. Studies & Humanities, Other	1,523	262	7			1,792
Biology, General		1,545	108	17		1,670
English Language and Literature, General		1,493	107	12		1,612
Business, General	712	476	33	9		1,230
Management Info. Sys. & Bus. Data Proc., General	839	252	79			1,170
Computer and Information Sciences, General	79	724	306	22		1,131
Law (LLB, JD)					1,120	1,120
General Studies	931	187				1,118
History, General		932	117	17		1,066
Liberal Arts & Sciences/Liberal Studies	254	721	13			988
Accounting	22	780	153			955
Political Science, General		911	22	8		941
Multi/Interdisciplinary Studies, Other		800	51			851
Economics, General		713	59	25		797
Sociology		749	40	6		795
Curriculum and Instruction			738	16		754
Business Marketing and Marketing Mgmt		742				742
Communications, General		601	20	8		629
Social Work		319	295	4		618
Education, General	24		484	84		592
Finance, General		552				552
International Relations and Affairs		420	119	8		547

[80] SCHEV data.

Appendix 5-C: 2000-01 Virginia College Graduates – Top 100 Academic Programs (cont.)

Program Title	Associate	Bachelors	Masters	Doctoral	1st Professional	Total
Information Sciences and Systems	2	405	112			519
Physical Education Teaching and Coaching		344	157	1		502
Administrative Asst/Secretarial Science, General	500	1				501
Social Sciences, General	269	198	2			469
Elementary Teacher Education		76	388			464
Art, General		436	15			451
Electrical, Electronics and Comm. Engin.		285	116	34		435
Protective Services, Other	434					434
Chemistry, General		354	36	32		422
Religion/Religious Studies	1	304	107	7		419
Medicine (MD)					402	402
Civil Engineering, General		288	90	21		399
Mathematics		321	57	7		385
Mechanical Engineering		306	47	12		365
Speech and Rhetorical Studies		359	1			360
Business Mgmt and Admin Services, Other		346	9			355
Biological and Physical Sciences	295	28	7	4		334
Counselor, Ed. Counseling and Guidance Services			310	12		322
Management Science		306				306
Public Administration		131	162	11		304
Education Admin and Supervision, General			265	11		276
Architecture		203	69			272
Mass Communications		211	58			269
Special Education, General		3	248	1		252
Mental Health Services, Other	97	154				251
Physical Therapy	65		179			244
Human Resources Management	4	214	21			239
Computer Engineering		208	22	1		231

Appendix 5-C: 2000-01 Virginia College Graduates – Top 100 Academic Programs (cont.)

Program Title	Associate	Bachelors	Masters	Doctoral	1st Professional	Total
Counseling Psychology			224			224
Systems Engineering		121	98	4		223
Health and Physical Education, General		205	14			219
Criminal Justice Studies		203	14			217
Pharmacy (Pharm. B, Pharm. D)					214	214
Drama/Theater Arts, General		188	25			213
Anthropology		188	19	4		211
Physics, General		135	42	34		211
Engineering, General	99	18	80	12		209
Foreign Languages and Literatures, General		187	22			209
Individual and Family Development Studies, General		170	23	7		200
Physical Sciences, General	172	27				199
Organizational Behavior Studies		135	46	13		194
Engineering-Related Tech./Technicians, Other	59	131				190
Chemical Engineering		157	16	13		186
Science, Tech and Society		175	8	1		184
Community Health Liaison		159	19			178
Foods and Nutrition Studies, General		163	11	4		178
Elec. & Elec. Engineering-Related Tech., Other	174					174
Parks, Recreation and Leisure Studies		140	24			164
Secondary Teacher Education		44	118			162
Forest Harvest and Prod Tech/Technician		131	17	8		156
Music - General Performance		140	15			155
Design and Visual Communications		148	6			154
Industrial/Manufacturing Engineering		77	66	11		154
Environmental Science/Studies		126	22	3		151
Philosophy		132	5	4		141
Criminal Justice/Law Enforcement Admin.		113	26			139

Appendix 5-C: 2000-01 Virginia College Graduates – Top 100 Academic Programs (cont.)

Program Title	Associate	Bachelors	Masters	Doctoral	1st Professional	Total
Hotel/Motel and Restaurant Management		130	5	4		139
Music, General		125	11			136
Multi-Interdisciplinary Studies, Other			132			132
Spanish Language and Literature		123	5	4		132
Speech-Language Pathology		78	54			132
Journalism		122	8			130
Visual and Performing Arts	12	83	35			130
Computer Science		125	4			129
Mechanical Engin.-Related Tech/Tech, Other	126	2				128
Speech-Language Pathology and Audiology		38	90			128
Criminology		126				126
Divinity/Ministry (BD, M Div.)					125	125
Special Education, Other	121					121
Geography		99	17			116
Animal Sciences, General		104	7	4		115
Geology		106	6	1		113
General Teacher Education, Other			97	11		108
Graphic & Printing Equip Operator, General	108					108
Health Professions & Related Sci., Other		76	29			105

Appendix 7-A: Application Patterns Across Public Four-Year Colleges and Universities – Fall 2000

Enrolling Institution		CNU	CWM	GMU	JMU	LC	MWC	NSU	ODU	RU	UVA	UVA-W	VCU	VMI	VPISU	VSU
Christopher Newport University	Accepted	1,005	2	33	24	71	9	15	168	106	1	10	81	1	23	8
	Rejected		70	52	116	18	57		39	10	11		11	1	141	
College of William and Mary	Accepted	8	1,330	26	224	8	116	1	23	3	184		28	1	170	
	Rejected			3	5		4				224			1	17	
George Mason University	Accepted	68	5	2,125	90	88	25	5	166	202	14	7	222	5	118	14
	Rejected	9	106		519	6	189		15	6	137		36	3	605	
James Madison University	Accepted	67	28	337	3,199	137	254		147	195	31	5	182	6	808	1
	Rejected	3	446	62		1	207		3		592		21	4	412	
Longwood College	Accepted	44	1	53	16	896	5	4	69	135		11	86	3	14	5
	Rejected	22	27	51	217		101		17	11	22		18	2	212	
Mary Washington College	Accepted	18	13	67	204	37	921	2	27	29	10	2	38		92	
	Rejected		211	7	42				1		118		2	1	47	
Norfolk State University	Accepted	5	2	1	1	2		1,302	36	7		1	13		8	133
	Rejected	84	2	27	16	2	4		207	12	3	3	95		30	3
Old Dominion University	Accepted	91	4	45	26	28	3	57	1,405	77	4	7	135	4	61	23
	Rejected	46	47	67	115	5	31	1		9	33		27	1	207	
Radford University	Accepted	47	1	68	21	124	2	11	106	1,746	2	22	140	2	34	6
	Rejected	65	15	107	366	71	81		63		26	1	50	4	575	
University of Virginia	Accepted	12	429	77	480	9	111	3	69	9	2,824	1	88	4	594	1
	Rejected		128	15	8		3						2		15	
University of Virginia's College at Wise	Accepted			2		4		1	2	14	1	279	7	1	10	2
	Rejected	4	3	8	5	6	4		3	11	4		2	1	31	
Virginia Commonwealth Univ	Accepted	66	15	96	89	109	23	56	239	173	30	14	2,729	7	119	51
	Rejected	102	84	206	300	42	76		131	81	99	3		11	420	1
Virginia Military Inst	Accepted	4	2	5	8	3	3		15	8	5	2	9	379	40	
	Rejected	2	7	2	20		1				10				43	
Virginia Polytechnic Inst and SU	Accepted	45	47	301	860	96	132	11	242	265	107	18	219	25	4,620	5
	Rejected	3	283	46	300		93		8	1	595		13	1		
Virginia State University	Accepted	4	1	5	3	2	1	136	10	3		3	14		2	884

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